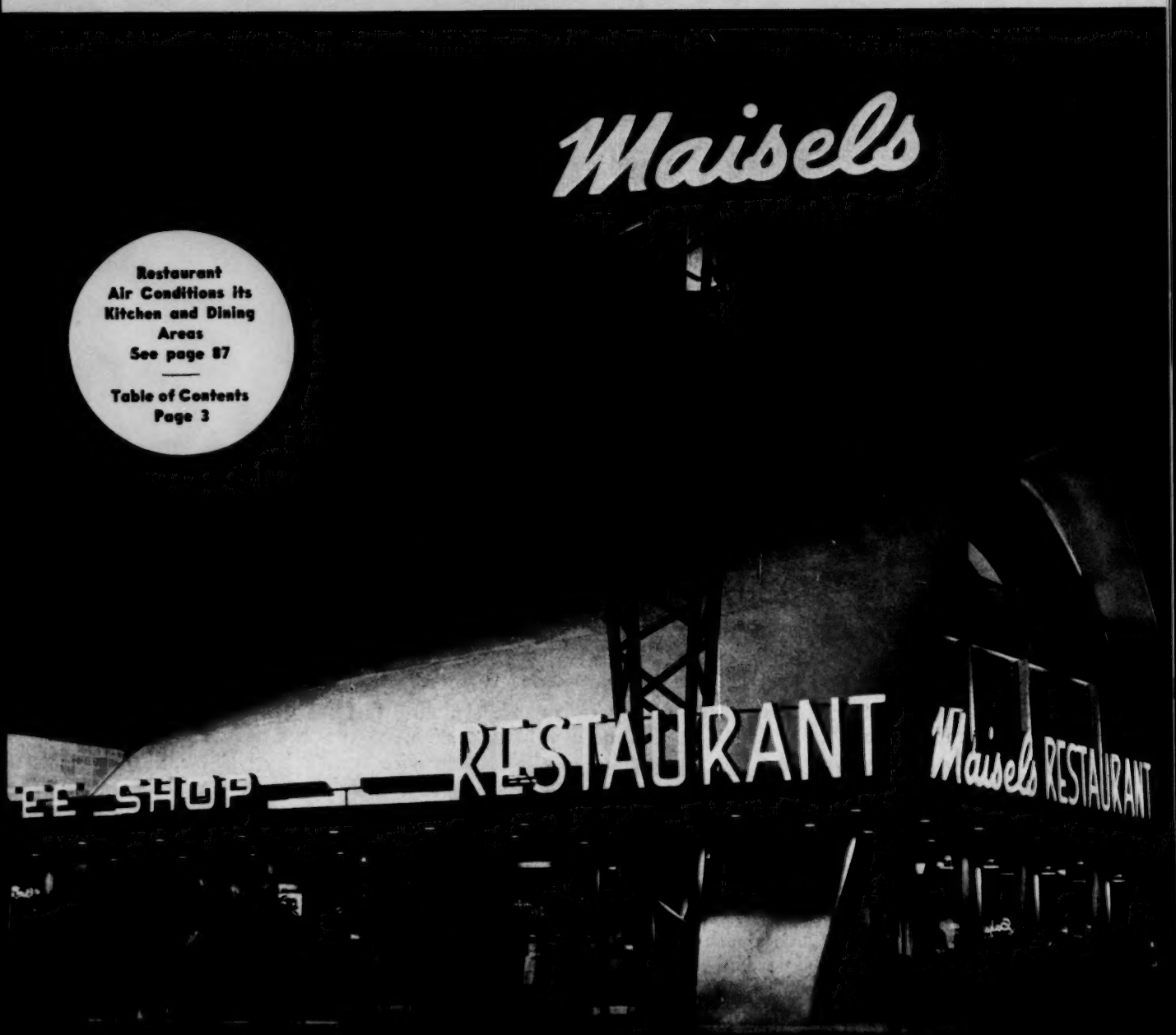
AIR CONDITIONING HEATING AND VENTILATING

FEBRUARY, 1959—56th Year



Restaurant Air Conditions its Kitchen and Dining Areas
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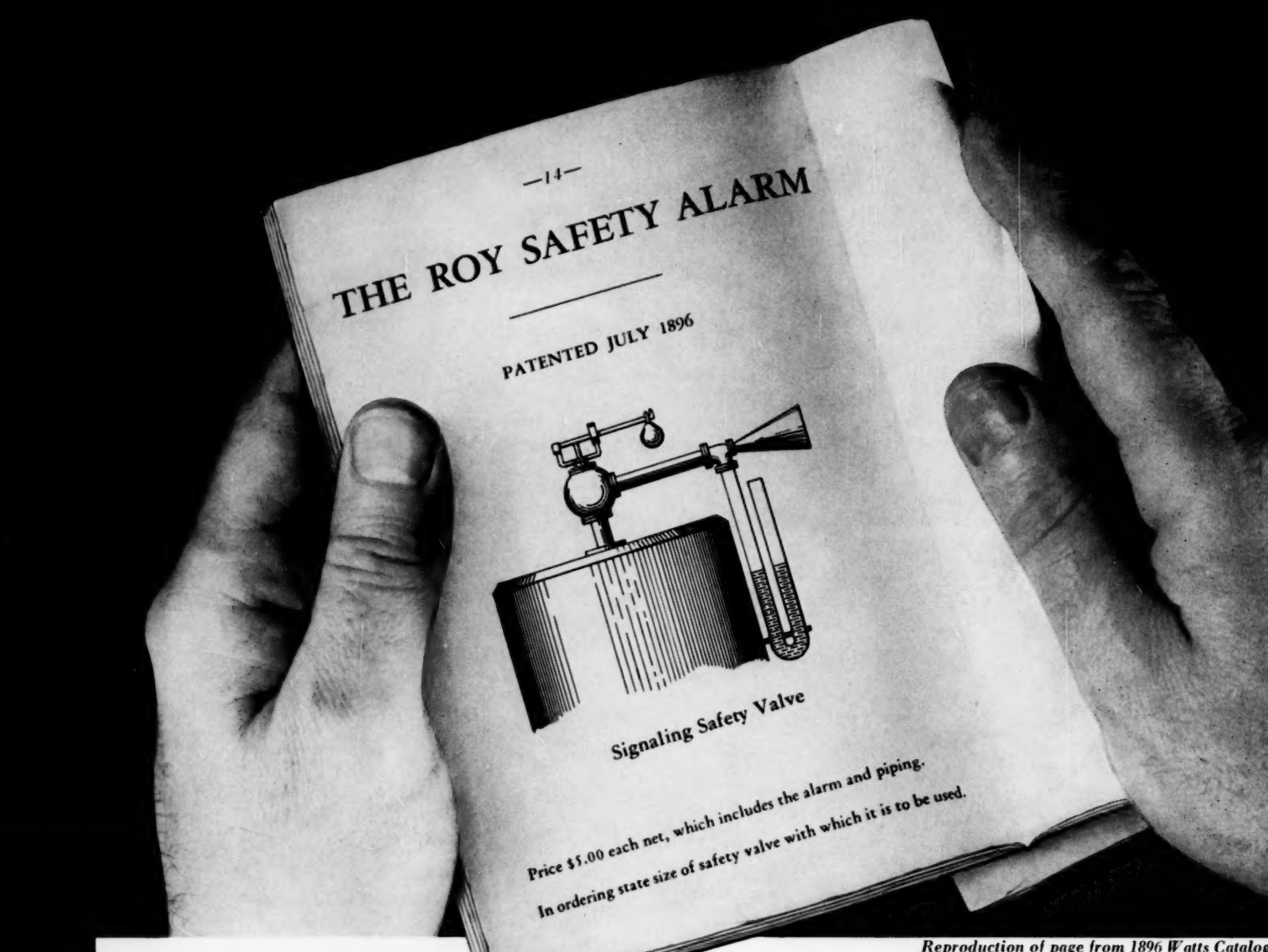

—14—
THE ROY SAFETY ALARM
PATENTED JULY 1896
Signaling Safety Valve
Price $5.00 each net, which includes the alarm and piping.
In ordering state size of safety valve with which it is to be used.

Reproduction of page from 1896 Watts Catalog

We don't sell insurance . . . we manufacture it!

In the early days, when Watts was a pioneer in the design and manufacture of safety valves and controls, they were known as "regulators". But what the founder of The Watts Regulator Company maintained he *really* made (and the company he founded continues to manufacture) was safety valve *insurance.*

For example, the Roy Safety Alarm (shown above) was patented in 1896 for extra insurance against accidents. Designed "for use on low pressure boilers or heating systems," this simple, ingenious invention shrieked a warning (by means of a horn or whistle) whenever excess steam pressure was generated, signaling that the equipment needed individual attention.

A crude device by today's standards, nonetheless it showed the company's *awareness* of the need for more complete control and safety.

Safety valves have changed, but not the spirit of the Watts Regulator Company. Watts engineers are still looking ahead . . . developing new products designed to provide the maximum in efficient protection and control.

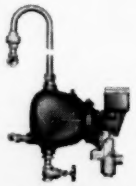
Since 1874 **WATTS REGULATOR COMPANY** *Lawrence, Mass.*

Be sure . . . use

WATTS

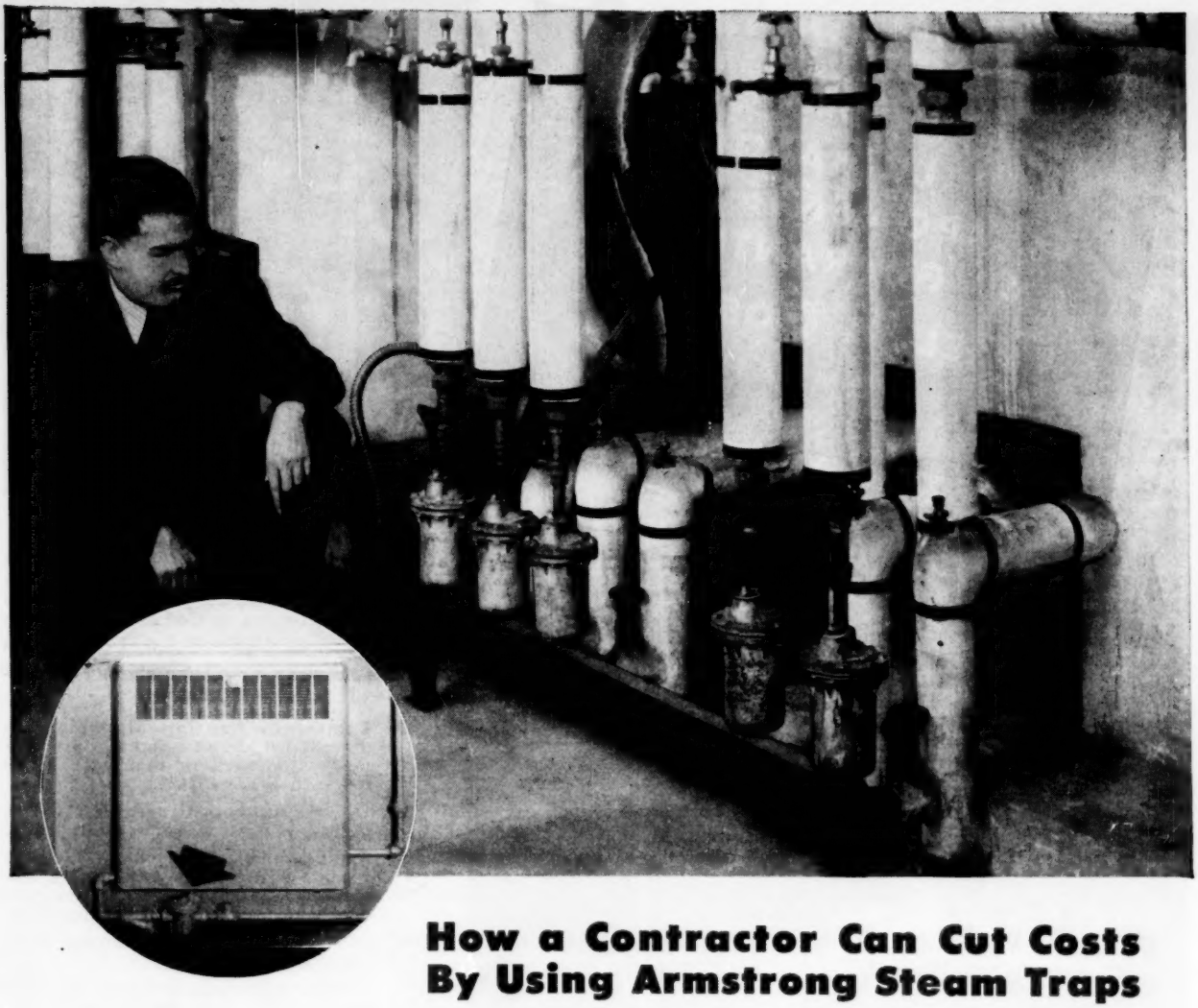
Protection and Control Specialties

T & P RELIEF VALVES


BOILER WATER LEVEL CONTROLS

PRESSURE REDUCING VALVES

A.S.M.E. RELIEF VALVES



How a Contractor Can Cut Costs By Using Armstrong Steam Traps

● There is more than meets the eye in steam traps. If you don't regularly specify Armstrongs, you ought to know about these cost factors:

1. First Cost. The size and, hence, price of a trap is determined by its capacity. The high capacity of each Armstrong trap often enables you to select a size smaller than you would otherwise use.

2. Installation Cost.

Connections. Armstrong offers you a choice of straight-through horizontal or vertical connections, as well as a right angle trap, to save fittings and labor.

Strainers—seldom needed because ordinary dirt and scale won't plug up an Armstrong. When strainers are desirable, Armstrong offers built-in strainer traps that cost less to buy and install than separate traps and strainers.

Check Valves. Here again, Armstrong offers a cost saving with a stainless steel, spring loaded internal check valve that is superior to external check valves.

3. Call-Back Cost. When you put in Armstrong traps, the job is done. The traps will work without attention, not just for a month or two or even a year, but *more commonly 3 or 4 or 5 years!* No traps have so enviable a record for low maintenance as Armstrongs because the mechanisms in low pressure traps are identical in design, workmanship and materials to those used in traps for 900 lbs. pressure, 900°F temperature.

Get the figures and the facts. Call your local factory-trained Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
8465 MAPLE ST., THREE RIVERS, MICHIGAN

How to Select and Install Steam Traps for Lowest Cost:

Here are two pieces of useful literature you should have—free on request:

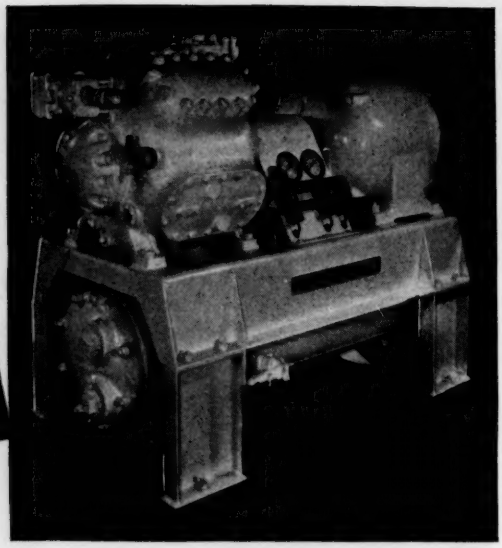
1. Armstrong Steam Trap Book—44 pages of trap data, tables, hookup diagrams and selection information.

2. Unit Heater Trapping—trap selection and installation plus BTU output tables for every model of 30 makes of unit heaters.

UNCONDITIONALLY GUARANTEED TO SATISFY THE USER — APPLICATION ENGINEERED

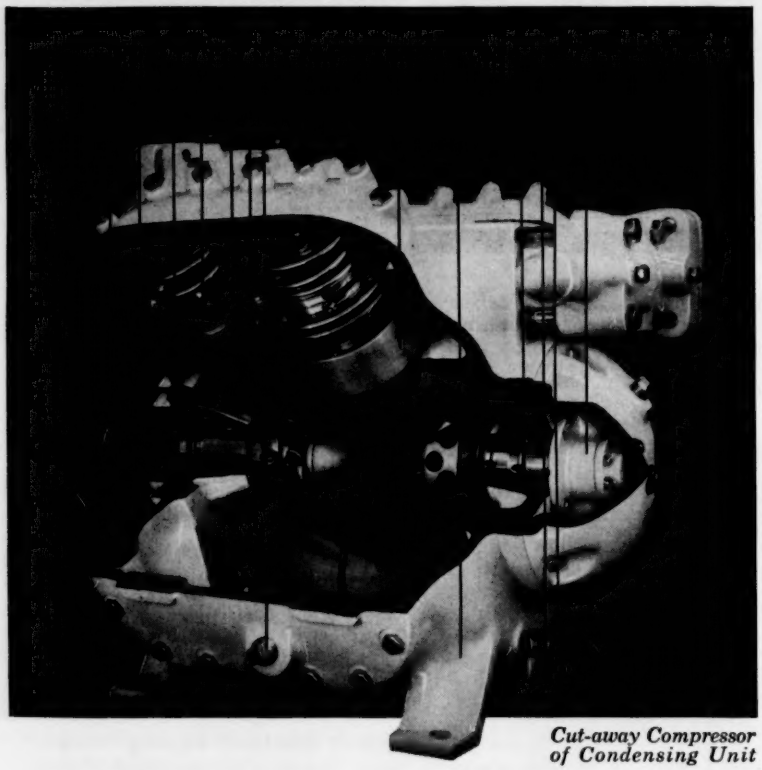
ARMSTRONG STEAM TRAPS

A complete "package" with
ALL MAJOR
COMPONENTS BUILT
AND GUARANTEED BY
BELL & GOSSETT
COMPANY



B & G CONDENSING UNIT

An achievement in compact efficiency, featuring interchangeable vital parts. 7½ through 150 tons.



Cut-away Compressor of Condensing Unit

The B&G Condensing Unit offers an impressive list of features, *many of them exclusive*, which make it completely outstanding. It is amazingly compact as well as efficient—the shortest unit available on the market today.

The cut-away illustration shows the highlights of compressor construction—

1. **Compressor housing.** Monobloc design using pressure-tight iron which meets Underwriters' requirements for use with R-12 or R-22.
2. **Cylinder heads and cover plates.** Cast of same material as compressor housing.
3. **Suction and discharge valves.** Highest grade Swedish steel—non-flexing, full floating. Low lift with positive gas-cushioned backstop for quiet operation.
4. **Safety springs.** Prevent damage from occasional liquid slugs.
5. **Pistons.** Automotive type, of light weight alloy. Full floating wrist pin, two compression rings and one oil control ring.
6. **Connecting rods.** Light weight, heat-treated alloy—rifle drilled to assure positive lubrication of wrist pin.
7. **Cylinder sleeves.** Removable cylinder liners of special alloy iron are machined and housed to a maximum tolerance of 0.0005 inches.
8. **Crankshaft.** High tensile, ductile iron. Greater strength and noise dampening qualities make it superior to conventional forged steel shafts. Running surfaces induction hardened and polished—shafts are statically and dynamically balanced—rifle drilled for forced feed lubrication.
9. **Main bearings.** Heavy wall bronze, diamond bored after assembly for close tolerance.
10. **Forced feed lubrication.** Positive-displacement, self-reversing oil pump supplies excessive oil to main bearings, connecting rods and wrist pins.
11. **Crank case heater.** Standard equipment on all compressors.
12. **Capacity Control.** Can be equipped with multi-step capacity control system.
13. **Standard equipment.** Gas and oil equalization ports, magnetic plugs and oil sight glass.

Reg. U.S. Pat. Off.

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COMPANY
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AIR CONDITIONING HEATING AND VENTILATING

Volume 56, Number 2 **February, 1959**

THE COVER

New Maisel Restaurant in Miami Beach, Fla., has an air conditioning system which serves kitchen, service and dining areas. Photograph, courtesy of Worthington Corporation, of Harrison, N. J.

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HIGH SPOTS

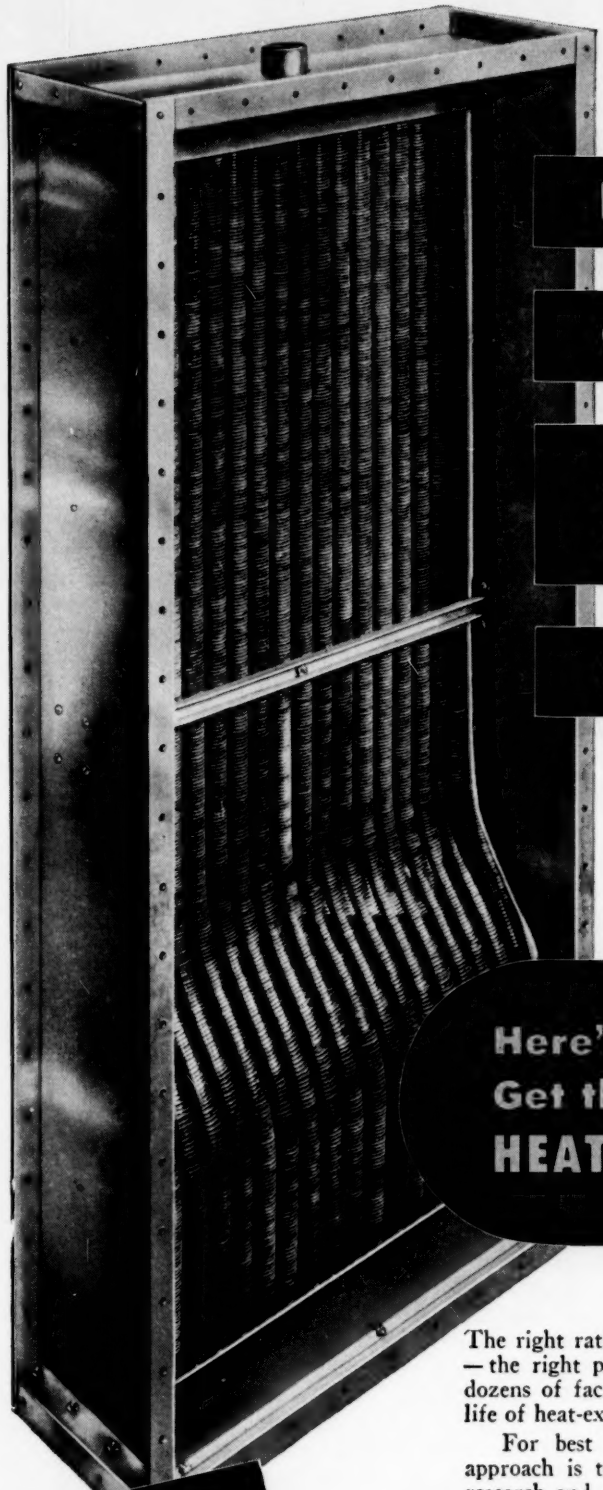
◆ **Despite national needs, enrollment in enginering schools and colleges continues to decline.** A downward trend begun two years ago will be continued into next year, said Dean Edward McHugh of Clarkson College of Technology. The seriousness of the situation is pointed up by contrasting the projected defense and industrial needs for five years with the declining curve of entering freshman, he said. Mr. McHugh, who heads the State Association of Engineering Colleges, issued his warning in letters to more than 800 high school guidance counselors.

◆ **The Joint Industry Program Committee of the Plumbing and Pipe Fitting Industry, meeting in Washington, D. C., on January 9, unanimously approved and released for publication details of the revised "Pittsburgh Agreement", covering jurisdiction of temporary heat in buildings under construction, which has been extended to include air-conditioning, refrigeration and all types of heating.** Key paragraph of the revised agreement reads: "For harmony and practicability the Pittsburgh Agreement is extended to cover all gas or oil fired unit heaters, and all refrigeration and air-conditioning installations." The new agreement also provides for payment of time-and-a-half (instead of regular straight time) for all hours worked in excess of forty per week where the Federal Fair Labor Standards Act applies to the construction job. Immediately after adoption of the temporary heat agreement, a four-man sub-committee was appointed to consider the merits of advising architects and engineers regarding the importance of writing clear-cut specifications, placing the responsibility for the maintenance of temporary heat in the heating contractor's specification.

◆ **Crane Company,** Chicago, announced that it would continue to produce cast-iron enameled plumbing fixtures in Chattanooga, Tenn., but that its **boiler-radiator manufacturing departments,** which are now shut down after having reached seasonal inventory requirements, **will not reopen.** The company is not going out of the heating business and has ample inventories for this heating season. According to the announcement, manufacturing facilities closer to the principal markets for hydronic heating are under consideration. The high freight costs of shipping boilers and radiators from a southern plant to northern markets, where more than two-thirds of the sales of this type of heating equipment is made, has resulted in a competitive disadvantage, the company states, resulting in substantial losses for many years.

◆ **A symposium on Thermal Properties of Gases, Liquids, and Solids,** sponsored by the Heat Transfer Div., The American Society of Mechanical Engineers, in cooperation with the Central Indiana ASME Section and Purdue University Thermophysical Properties Research Center, will take place at Purdue University on February 23, 24, 25, and 26. Registration is in charge of Prof. R. A. Olsen, School of Mechanical Engineering, Purdue University, Lafayette, Ind.

◆ **September, 1958 shipments by manufacturers of compressor bodies were about 20% ahead of similar shipments the previous September,** Air-Conditioning and Refrigeration Institute's Small Compressor Section reported. This was the second consecutive month in which shipments ran ahead of those for the corresponding month in 1957, ARI said. During the first seven months of the year, manufacturers' shipments were considerably below 1957, and at one time in mid-summer the "year-to-date" shipments were as much as 25% under the comparable period of last year.



Heating?

Cooling?

Air Conditioning?

Process?

Here's How to Get the RIGHT Answer to your HEAT-EXCHANGE PROBLEMS

The right ratio of surfaces – the right materials – the right velocities – the right proportion between coil area and depth . . . there are dozens of factors that affect the efficiency, maintenance and service life of heat-exchange coils.

For best performance in your own application, the practical approach is to take full advantage of the unequalled engineering, research and design skill – the unequalled manufacturing and testing facilities – which Aerofin offers you.

To get the *right* answer – ask the Aerofin man.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

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WASHINGTON OVERTONES

by LORING F. OVERMAN

● With a new Democrat-dominated Congress in Washington, it was difficult during the first weeks of the Session to distinguish tone from overtone.

Sparring for position was soon out of the way, however, and legislative sounds began to clarify. From the Administration side came such basic chords as "balanced budget, inflation safeguards, and tax conservatism."

Tones sparkling with the promise of gayer, lighter rhythms provided contrast. These proposed tax cuts, more liberal exemptions, expanded social security coverage, and higher minimum wage requirements, were among others.

For those in the air conditioning, heating and ventilating fields, actions of the 86th Congress may be expected to provide a definite aura of business stimulation, possibly coupled with added responsibilities taxwise, wagewise, and otherwise.

● Evidence that official Washington feels that it can no longer accept dollar-value as the yardstick of accomplishment comes from the Department of Commerce. In the future the Department will report the GNP (Gross National Product) in two ways—in terms of current dollars and in terms of 1957 dollars. Thus the gap between the two dollar figures will mirror the effects of inflation.

● In addition to comparative data on Gross National Product, members of heating, ventilating and air conditioning industries will soon have access to other helpful business information.

Industry members are being asked by the Department of Commerce to provide information through the 1959 Census of Manufactures, covering operations in 1958. Most recent census providing a similar compilation was taken in 1955, covering 1954 operations.

First of the current questionnaires were mailed January 15, with returns requested within 30 days of receipt of the forms by industry members. Publication of preliminary reports later this year is promised. The following are among the Census Classifications asked to report:

MC-35V, valves and fittings, metal plumbing fixtures; MC-34E, heating and cooking apparatus, blowers, exhaust and ventilating fans, mechanical stokers; MC-35Q, industrial furnaces and ovens; MC-35T, refrigeration and air conditioning equipment.

● Industry members will have a direct interest in the fate of a multi-billion dollar housing bill introduced in the House by Albert Rains (D-Ala.) Chairman of the House Subcommittee on Housing. The bill is one of many housing measures introduced in both House and Senate, but the Rains bill covers the entire keyboard of legislation in this field. The Rains measure provides for:

35,000 units of public housing per year to start, with 200,000 to 400,000 possible under specified future conditions.

$500-million a year for three years for slum clearance; provisions for increases to $600-million a year.

$500-million a year for direct purchase of GI and FHA-insured home mortgages.

$200-million a year for loans on moderately-priced homes for aged persons.

$500-million a year for low-interest loans to colleges for dormitory construction.

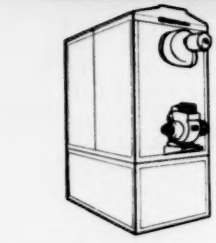
Lower down payments, higher maximum loans (to $25,000 from $20,000) and more liberal terms for FHA-insured mortgages.

Indications are that either the Rains bill or a similar Sparkman Omnibus bill introduced in the Senate will be among the early actions of the 86th Congress.

(Continued on page 8)

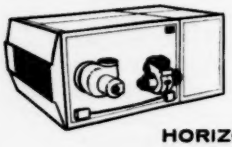
New MAXI-THERM

Stainless Steel, Heavy Duty Furnaces



UP FLOW

COUNTER FLOW



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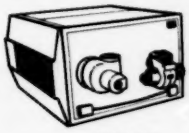

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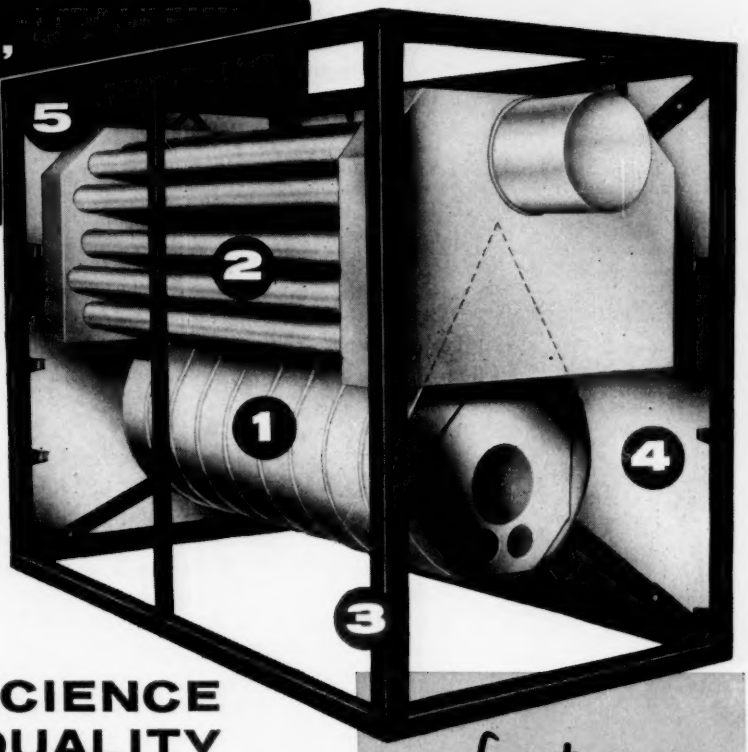


FOR THE CONSCIENCE CALLING FOR QUALITY

Humble of birth but proud of purpose, a new high capacity furnace has come into being after years of development and field-proof. It is built for the discerning – those willing to set patterns, not follow them – those who can tell a quality product without its name plate. Yet this quality is somewhat betrayed by its price which will appeal to all.

Not a new concept in industrial and commercial warm air heating, but rather a new philosophy – a promise of superiority from engineering down to the last weld in the new, stronger, heavier gauge #442 stainless steel combustion chamber. As a small manufacturer, we cannot afford to settle for less. The success of MAXI-THERM must be linked strongly to its inherent quality.

And once you have inspected the new MAXI-THERM in any of its four models, you will agree that while our sights are set high, the finished product is "on the target."

For industrial and commercial applications from 120,000 to 2,500,000 BTU's. Larger specials can be constructed to your specifications. Available in Up Flow, Counter Flow, Duct and Horizontal Models to fit any space requirement efficiently. Oil and/or gas fired, single or dual fuel. Firing equipment U.L. or A.G.A. inspected or approved. Also a complete line of refractory lined furnaces in standard capacities to 2,000,000 BTU's.

features

1. **New, stronger, heavier gauge #442 stainless steel ribbed tear-drop construction, two-pass combustion chamber for longer life and greater efficiency.**
2. **Two-pass aluminized steel exchanger provides a four-pass system.**
3. **Quint-Angle one-piece welded 12-gauge frame construction.**
4. **Polished radiant shield.**
5. **Tube and transfer box access plate.**

Write for specification details or representation information

CSF

Chicago Steel Furnace Co.

9324 S. Anthony Ave. • Chicago 17, Illinois

WASHINGTON OVERTONES *(Continued from page 6)*

● Whatever the outcome of housing legislation, there'll be a new Housing and Home Finance Agency boss to administer it. Subject to Senate confirmation, the President named Norman P. Mason, Commissioner of the Federal Housing Administration, to succeed Albert M. Cole as HHFA Administrator. Mr. Cole resigned to accept a position in private industry.

● Despite recession problems in many industries, privately financed starts in housing ended up 1958 with a 14% gain over 1957. Total private starts amounted to 1,130,600 in '58. Total of 1,197,700 for both private and public housing starts was 15% above 1957. Increases in '58 were due largely to a sharp upturn in FHA assisted financing.

Approximately 20% of all public and private units started during the year were in apartment buildings and other multi-unit structures—30% above 1957.

Private starts in December were at the seasonally adjusted rate of 1,430,000—highest in four years.

● Industry members are cautioned against taking December as a too-accurate yardstick of housing performance in 1959. Tight money may become the restraining influence.

Home builders have already claimed a large volume of mortgage money available, and quick action by Congress will be necessary if new authorizations are to become available promptly. Meanwhile, Washington continues to consider it necessary to "brake inflation". Stiffer curbs on credit by the Federal Reserve are expected; upping of the discount rate is likely, and interest rates higher by ½% are likely.

With industry planning to expand facilities, and business extending its inventories, the combined demand for credit may dwarf present figures.

● Preliminary estimates from Departments of Commerce and Labor place at $49-billion the dollar value of new construction put in place during 1958—2% above the record 48.1-billion dollars in 1957.

Outlook for 1959 is a 7% gain to $52.3-billion. Private projects are expected to rise 4%, with housing leading. Public projects may be up 15%, with biggest gains in public-financed housing, highways, military facilities, and sewer and water facilities.

Manufacturers of unitary air conditioners, proud of a new certification plan of published Btuh ratings, are looking forward to 1959 with confidence. First edition of a "Directory of Certified Unitary Air-Conditioners", listing 31 companies participating in the project, is off the presses. The program was initiated several months ago by Air-Conditioning and Refrigeration Institute in cooperation with the National Warm Air Heating and Air-Conditioning Association.

The directory is being sent to dealers and contractors, to architects and consulting engineers, to government personnel concerned with air conditioning. The director is also made available to the public through dealer and contractor outlets, and offices of the Better Business Bureau.

Supplements to the directory will be issued as additions or alterations are required.

● Lively demand is reported for newly-published ASA Standard B9.1-1958 "Safety Code for Mechanical Refrigeration". The publication, a revision of a previous code, has been under preparation for several years. American Society of Refrigerating Engineers is the sponsor. A major project of ASRE is to have the code included in existing local codes, or into new state and municipal regulations when they are under consideration. Copies of the standard are available at one-dollar each through Henry G. Strong, Executive Secretary RISAC, 1346 Connecticut Avenue, Washington, D. C.

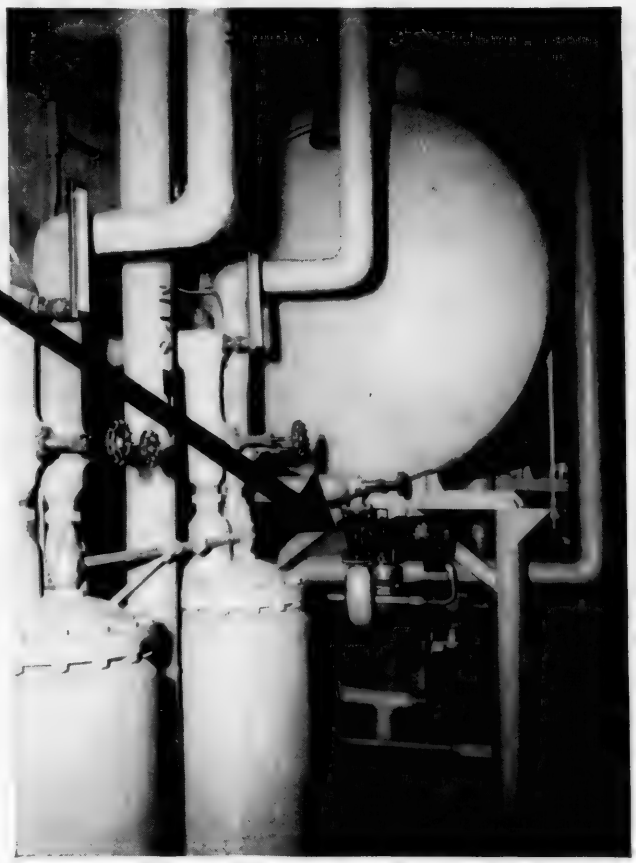
B&G ALL-BRONZE BOOSTERS

FOR LONG LIFE IN CIRCULATING HOT OR COLD RAW SERVICE WATER FOR FAUCET OR INDUSTRIAL USES

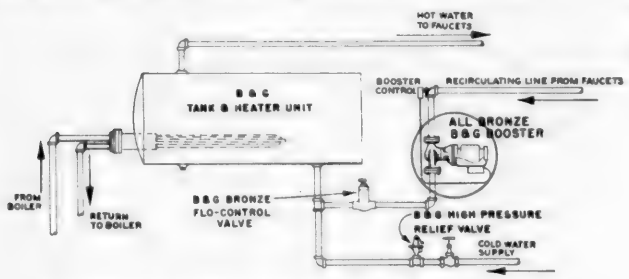
Where hot or cold service water is to be pumped, the use of an all-bronze pump is imperative. Otherwise, the corrosive effects of continuously pumping fresh water materially shortens pump life.

The B&G All-Bronze Booster is specifically built for service water pumping applications. In such systems, the Booster can be installed in numerous ways to step-up efficiency, increase hot water production and reduce heating costs. It is immune to corrosion, hence will give years of dependable service.

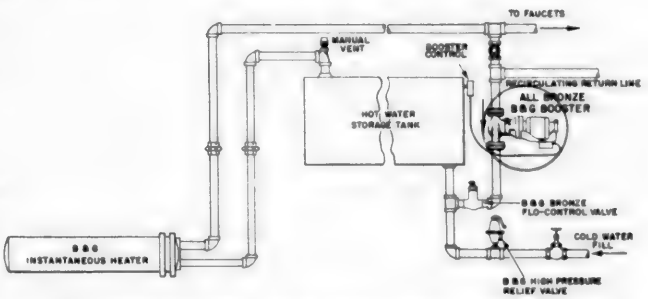
For *quiet* operation, failure-proof performance and long life, the B&G Booster is the *preferred* pump.



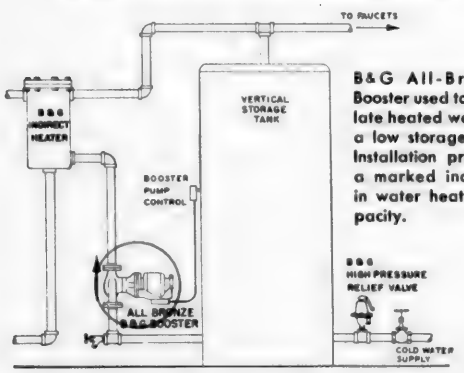
Installation of B&G All-Bronze Booster in Chrysler automatic transmission plant at Kokomo, Indiana. This small unit handles the circulating requirements of the service water heating system.



B&G All-Bronze Booster used on recirculating line from hot water faucets maintains hot water at fixtures at all times. Recommended on all installations, particularly where long plumbing lines are used.



All-Bronze B&G Booster used to provide an extra supply of hot water from an undersized boiler. Semi-tankless hook-up maintains initial supply of hot water.



B&G All-Bronze Booster used to circulate heated water to a low storage tank. Installation provides a marked increase in water heater capacity.

Send for Bulletin No. IA-856

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Dept. FP-4, Morton Grove, Illinois

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BRIEFLY STATED

WITH THE ENGINEERS

As of the first of the year, partners in the firm of VOORHEES WALKER SMITH SMITH & HAINES, 101 Park Avenue, New York 17, N. Y., were Perry Coke Smith, Benjamin Lane Smith, and Charles Haines. Stephen F. Voorhees and Ralph Walker are consultants to the firm. . . .

Appointment of Ned Lamprecht to the post of chief application engineer is announced by THE AIR-MAZE CORP., Cleveland, Ohio. He will be responsible for coordinating the company's engineering and sales facilities for applying air and liquid filters to all types of industrial products. A graduate of Case Institute of Technology, Mr. Lamprecht joined Air-Maze in 1946 as development engineer. . . .

FAY, SPOFFORD & THORNDIKE, INC., Boston, Mass., engineering firm, announced appointment of five directors to the office of vice-president simultaneously with its decision to open a new branch office in Phoenix, Ariz. The firm is among the top ten engineering organizations in the country, embracing such projects as port and terminal work, industrial plants, water works, highway work of any magnitude, bridges, sewerage systems, airports and military bases. The five new vice-presidents are Edward C. Keane, Burdette K. Beebe, Fozi M. Cahaly, Leon B. Turner, and Harold H. Jones. All have been with the firm for many years. . . .

J. D. Mattimore is appointed a vice-president for product engineering and research of TUBE TURNS DIV., CHEMETRON CORPORATION. He is an authority on industrial piping, has been director of Tube Turns' product engineering and research department and will continue to supervise its work. Mr. Mattimore joined the firm as assistant director of research in 1942, following 12 years as development design and works engineer with Walworth Company, valve manufacturer, and extensive experience with boiler manufacturers and firms specializing in the design of power plants.

SOCIETIES AND ASSOCIATIONS

The Eastern Missouri Chapter, AMERICAN SOCIETY OF SANITARY ENGINEERING, met with John Sullivan, assistant director of sanitation, St. Louis County Health Department, for a discussion of the prevention of the spread of disease by poorly installed or defective plumbing. There are few places in this country where adequate plumbing inspection and correction programs have operated effectively enough to eliminate existing back-siphonage problems, Mr. Sullivan stated. He recommended surveys in every community to detect and eliminate faulty conditions, in which every agency of government concerned should participate, and warned against a recurrence of incidents like the disastrous Chicago hotel dysentery epidemic of 1933 which resulted in 1309 cases and 98 deaths. . . .

John F. Hennessy, Jr., vice president of Syska & Hennessy, mechanical and electrical engineers, was elected president of the NEW YORK ASSOCIATION OF CONSULTING ENGINEERS at its 34th Annual Meeting. The group maintains its headquarters at 115 East 40th Street, New York, N. Y. Elected vice-presidents were Richard T. Baum of Jaros, Baum and Bolles, and Sigmund Roos, head of his own firm. Joseph L. Fraioli of Fraioli-Blum-Yesselman, was elected treasurer and Samuel A. Bogen, head of his own company, was re-elected secretary. . . .

At the recent REFRIGERATION SERVICE ENGINEERS SOCIETY Annual Convention in Columbus, Ohio, A. J. "Joe" Lane, Raleigh, N. C., was elected international director, representing the Carolinas, Georgia and Florida. Mr. Lane represents the Dole Refrigerating Co., Chicago, Ill., as district manager for the Atlantic Central area. . . .

Ennis C. Smith of Hudson Engineering Corp., Houston, Tex., is elected secretary of COOLING TOWER INSTITUTE, Palo Alto, Calif. He fills a vacancy created by resignation of The Marley Company from CTI. James P. Wiseman of Fluor Products Co., Whittier, Calif., is elected treasurer; Karl E. Johnson of J. F. Pritchard & Company of California continues as president, and Ernest E. Goitein of Foster Wheeler Corporation as vice-president of the national association. Headquarters and field research programs continue under direction of Executive Manager Raymond C. Kelly.

ANNIVERSARY

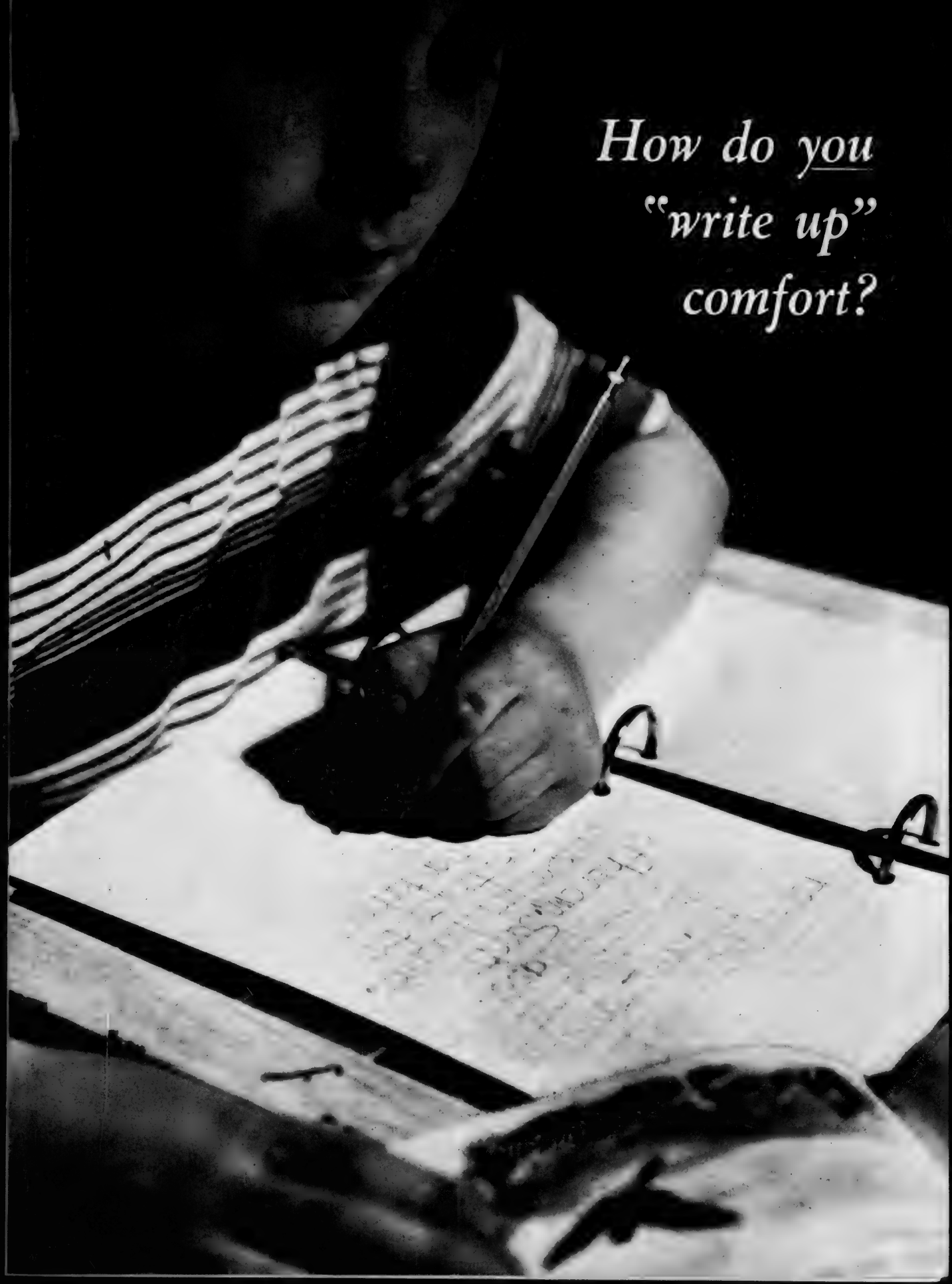
SPORLAN VALVE COMPANY, St. Louis, Mo., is celebrating its 25th anniversary. While the business association of Harry T. Lange and Herman F. Spoehrer began in the mid-twenties, their present company was established in 1934, known then as the Spoehrer-Lange Company. Distribution today of its line of expansion valves, distributors, filter-driers, etc., to original equipment manufacturers and over 250 wholesalers is handled by a staff of 25 engineers operating in 20 sales offices throughout the United States.

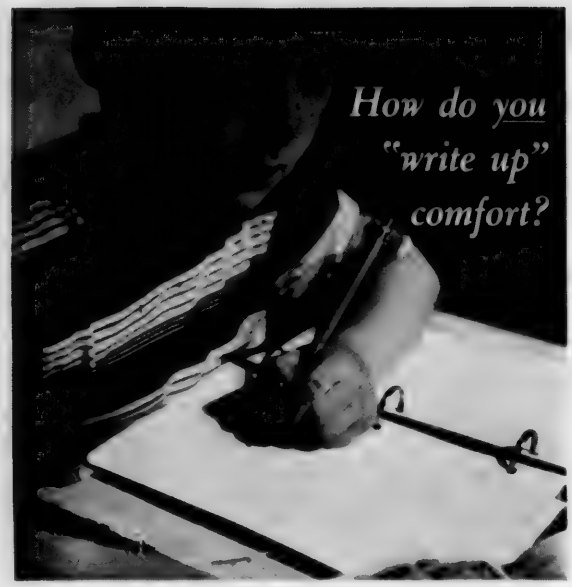
BURGEONING BUSINESS

Formation of an INDUSTRIAL DIVISION by AMERICAN RADIATOR & STANDARD SANITARY CORPORATION, with headquarters in Detroit, Mich., is announced. The new division, created by the consolidation of American Blower, Kewanee Boiler, and Ross Heat Exchanger Divisions, will continue to manufacture and market the same products made by the three separate divisions. President of the Industrial Division is John W. Brennan, formerly president of American Blower. Other Division executives include: Richard S. Reade, vice-president, manufacturing (former Ross president); Albert M. Palmer, vice-president, customer relations (former Kewanee president); Edwin W. Petersen, vice-president, marketing; Richard L. Bernhard, vice-president, engineering. General sales manager is Donald L. Clithero. . . .

During its first year of operation, ARKLA AIR CONDITIONING CORPORATION, Shreveport, La., marketed its Sun Valley gas heating and air conditioning units under the terms of a gas-industry-wide pact sponsored by American Gas Association. The program called for a 20% price reduction on all Arkla products and a commitment on the part of the gas industry to sell 4,600 units during 1958. Practically all gas companies

(Continued on page 14)


How do you
"write up"
comfort?

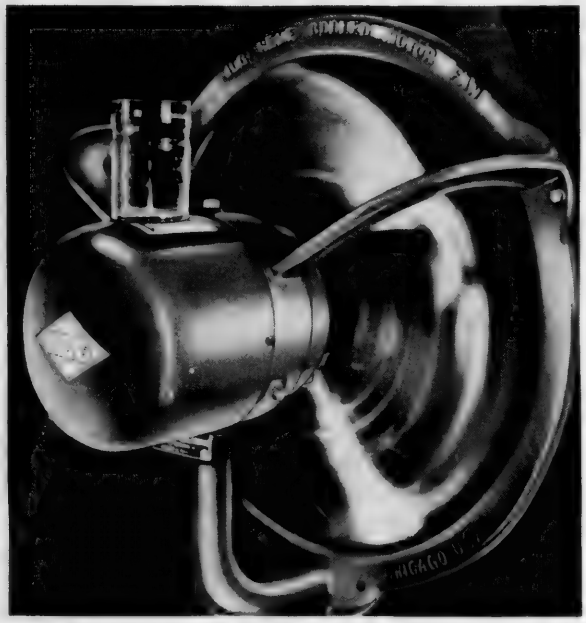


When it's comfort via ventilation...

In the past two years 1110 schools and universities throughout the country installed Ilg electric ventilating equipment.

Consulting engineers as well as school boards know today's crowded classrooms and higher standards make proper ventilation more a "must" than ever before . . .

Here's why ILG fans and motors move more air



Not a Ripple in the Glass at 1140 revolutions. Ilg direct-connected propeller fans are quiet, vibration-free power savers. Ilg's "One-Name-Plate" pledge of performance covers *both* the dynamically balanced, patented Type "Q" fan wheel . . . the Ilg-built self-cooled, permanently lubricated motor.

Low-Down on Low Silhouette. Ilg power roof ventilators, with lifetime aluminum housings, are low in height, low in operating costs, low in maintenance. Ilg-built self-cooled motor —direct-connected to patented "Q" Type fan wheel—assures quiet, vibration-free operation. Choice of 11 sizes, single-phase permanent-split capacitor or 3-phase motor.

For fans built to satisfy your "specs"...

1110 schools recently "wrote up" comfort this way . . . ILG

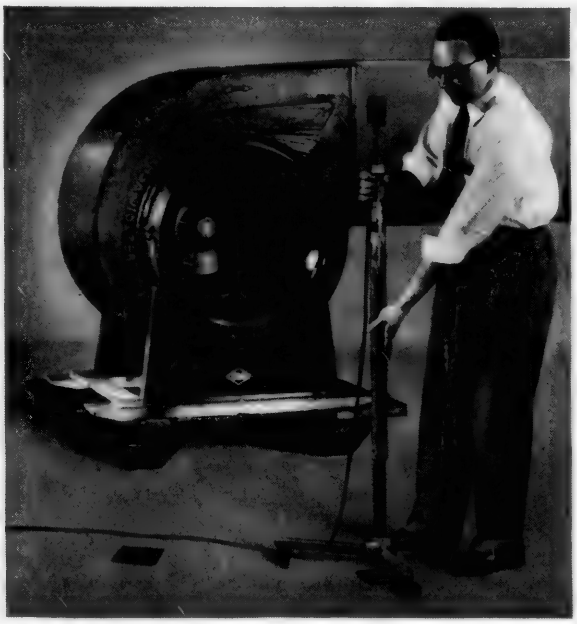
that the health as well as the study habits of today's students all too often hinges upon having enough fresh air.

But why the preference for Ilg fans and ventilators? Shown below are some of the reasons why Ilg equipment rates so well with consulting engineers . . . and with school authorities. Ilg fans cost less to operate, move more air more quietly for more years, last longer with less maintenance.

For further details on the complete line of Ilg ventilating equipment, send for Catalog No. 159 on propeller fans, Bulletin No. 257 on *airfoil* centrifugals, Bulletin Nos. 2302 and 2701 on power roof ventilators.

ILG *power roof ventilators*

more quietly for more years



"X Marks the Spot" where the traveling mike picks up sound waves from this Ilg BC *Airfoil* centrifugal. Backward Curved (BC) blades eliminate eddy currents and turbulence. Sound tests prove these direct-connected fans can provide larger air capacity than older types—with *no increase in sound level,* with *less drag and shock loss.* For operations to 9" static pressure.

Heart of the Matter. Ilg Backward Curved *Airfoil* centrifugal fans—under this low profile housing—assure smooth, quiet air flow and low shock loss. Ilg-built, *self-cooled* motors eliminate heat build-up of *any* type. Direct connection does away with belt maintenance, friction loss, slippage.

specify ILG

ILG ELECTRIC VENTILATING COMPANY
2851 N. Pulaski Road, Chicago 41, Illinois
Offices in 57 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

BRIEFLY STATED

(Continued from page 10)

participating have surpassed their quotas, and unit number 4,601 had been shipped from the company's Evansville plant by August 13. Total shipments for the year exceeded 8,000, the company announces. Also, Bob Eskew, who had been with Arkla's predecessor, Servel, has returned, in charge of engineering, research and development; and Dr. Philip P. Anderson, refrigeration expert, has transferred to the company. He had been with Carrier. . . .

Transfer of all assets and the going business of L. O. F. Glass Fibers Co., Toledo, Ohio, to newly-organized JOHNS-MANVILLE FIBER GLASS INC., a wholly-owned subsidiary of Johns-Manville Corporation, has been accomplished. Among these assets are seven fiber glass plants and a Fiber Glass Research and Technical Center at Waterville, Ohio, formerly operated by L. O. F. R. H. Barnard has been elected president, the same post he held with L. O. F. F. H. May, Jr., is elected vice-president and general manager. . . .

The name of Berger Furnace Division, Belle Vernon, Pa., is changed to BURNHAM CORPORATION WARM AIR & COOLING DIVISION, John J. Hildebidle, recently appointed general manager of the division announced. Parent Burnham Corporation is located in Irvington, New York. . . .

SIMPLEX TIME RECORDER CO., Gardner, Mass., has acquired the Time Equipment Division of International Business Machines Company. Key personnel and all operations are transferred to Gardner from Endicott, N. Y., where the IBM division was located. Simplex has purchased two buildings and built a third to house its increased activity. Curtis G. Watkins, Simplex president, estimates that the result of buying the IBM division will be an increase in volume of 300% in the company's Printing Department, of 100% in industrial time recorders, and 700% in its institutional line of equipment for schools, hospitals, and public buildings, with overall sales increasing about 500% within a reasonable time. . . .

Ownership of JAS. P. MARSH CORP., Skokie, Ill., and subsidiaries has been acquired by COLORADO OIL & GAS CORPORATION of Denver, Colo. Marsh was founded in 1865 and is one of the three largest manufacturers of indicating pressure gages, also manufacturing thermometers, heating specialties, refrigeration controls and valves. Colorado Oil & Gas is primarily engaged in the drilling, production, refining and marketing of petroleum products, and is embarking upon a program of diversification. Marsh will continue to operate as in the past, retaining its identity, personnel, sales representation and policies. However, changes in the board of directors and executive officers, resulting from the retirement of C. H. Olmsted, chairman of the board, and Barrett Scudder, president, have been made. W. C. Norman, president of Colorado Oil & Gas becomes chairman of the board, and A. D. Rose, former executive vice-president and general manager of Marsh, was elected president. . .

An extensive field re-organization is taking place in WORTHINGTON CORPORATION'S AIR CONDITIONING & REFRIGERATION DIVISION. The plan divides the Continental United States into 9 Zones, each headed by a zone manager, who is responsible for all air conditioning and refrigeration activities within his Zone. A. F. Ward has been appointed sales manager of the new field organization with jurisdiction over all of the zone managers. These zone managers include: H. Fleit and W. Souther, Northeast Zone; J. Klaiber, Central Zone; J. Wait, Southeast Zone; J. Cavanaugh and D. Michelson, Central East Zone; R. Gundlach, Midwest Zone; W. Dorsey, Central West Zone; E. Salaun, Southwest Zone; J. Winters, Western Zone; and K. Blessing, Northwest Zone. H. A. Caldwell, formerly southeast distribution manager, has been appointed Eastern National Account Manager.

NEW REPRESENTATIVES

MODINE MANUFACTURING CO., Racine, Wis., has named Weber-Rishel Company sales representatives for the Cincinnati, Ohio, territory. The firm is located at 3810 West Street. Williams and Staup, Inc., 4107 Willys Parkway, Toledo, Ohio, have been appointed for the Toledo territory, and Meacham Pump and Equipment Company, located at 24 Belmont Avenue, has been named sales representatives in the Springfield, Mass., territory. All three firms will represent the entire line of Modine heating and air conditioning equipment. . . .

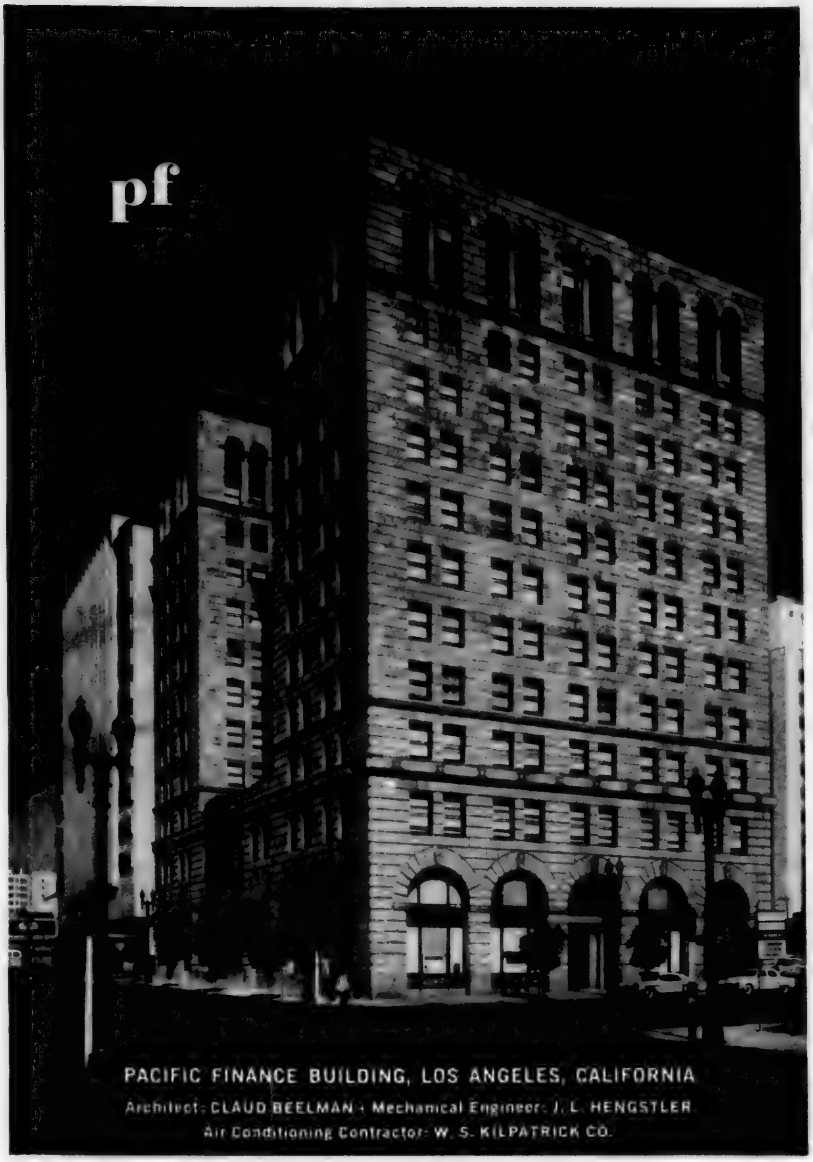
Two new territory appointments have been announced by TACO HEATERS, INC., Cranston, R. I., covering the states of Minnesota, North Dakota, South Dakota and the western part of Wisconsin: R. M. Cotton Co., 6135 Kellogg Avenue, Minneapolis 24, Minn., is distributor for Taco commercial and industrial products; Sales Engineers, 6524 Walker Street, Minneapolis, distributes stock items. . . .

Air Systems, Inc., 18263 North McNichols Rd, Detroit 19, Mich., is a new agency formed by merger of three Detroit firms. It will market AMERICAN AIR FILTER COMPANY'S air filter, dust control, heating and ventilating, air conditioning, etc., as well as Illinois Engineering specialties. All employees of Saunders & Company, Earl W. Graham, and AAF's Detroit branch will make up the personnel of Air Systems. The Ray Co., 4411 Belmont Avenue, Dallas, Tex., has acquired a sales agreement with AAF to market its line of air filter products. This line formerly was represented by Gilbert Engineering Co., also of Dallas. . . .

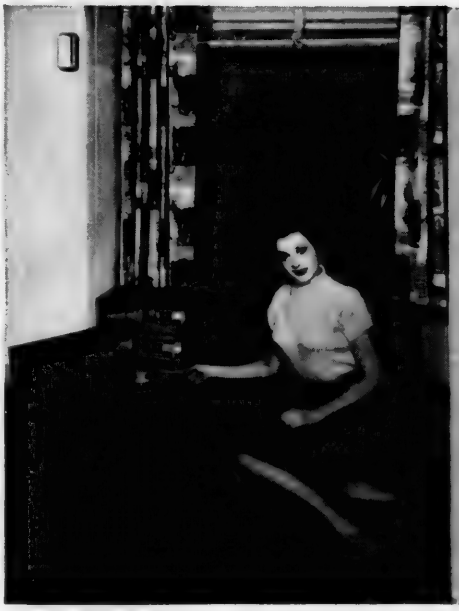
Distribution arrangements were recently completed between HUBBELL CORP., Mundelein, Ill., and SPORLAN VALVE CO., St. Louis, Mo. Principal products added to the Sporlan line by this move are Hubbell back pressure regulating valves, combination back pressure and stop valves, plus large capacity solenoid valves, all natural adjuncts to the line of thermostatic valves, solenoid valves and other accessories manufactured and sold by Sporlan. . . .

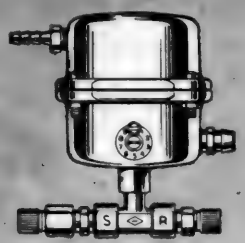
R. H. Sparks Company, 1405 — 29th Street, Des Moines, Iowa, has been appointed distributor of DRAVO CORPORATION, Pittsburgh, Pa., heating equipment and Interlocked and Welded grating and stair treads for a territory which includes a large part of the state of Iowa and Rock Island county in the state of Illinois.

(Continued on page 150)



PACIFIC FINANCE BUILDING, LOS ANGELES, CALIFORNIA
Architect: CLAUD BEELMAN • Mechanical Engineer: J. L. HENGSTLER
Air Conditioning Contractor: W. S. KILPATRICK CO.





POWERS CONSTANT AIR VOLUME REGULATOR

(550 installed here)

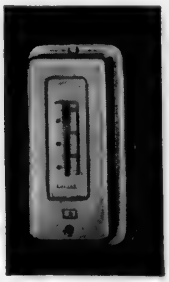
Photo shows it mounted within the mixing box of high velocity dual duct air conditioning system.

Room thermostat controls hot air valve and CAV Regulator controls cold air valve. Working together they provide precise room temperatures at constant air volume, regardless of static pressure variations in air supply ducts. (D-6)

Big Dividends from MODERNIZATION and POWERS

Air Conditioning Control

While many building owners in Los Angeles talked about smog and heat problems, Pacific Finance Corporation eliminated both in its 32 year old building at Wilshire Blvd. and Hope Street.



Powers Individual Room Control now provides year 'round personalized comfort for employees and tenants. Properly conditioned smog-free air is distributed throughout the building to 450 under-the-window and 100 ceiling type high velocity dual duct air conditioning units.

Dividends from a Powers Controlled air conditioning system:

- Higher Rental Income
- Employees accomplish more and make fewer mistakes
- Less absenteeism
- Fewer service calls, lower cost maintenance
- **Powers complete responsibility** for a correctly engineered control system, proper installation, continuous successful operation and **SERVICE** when required from offices in 85 cities.

When you Air Condition or plan a new building, ask your architect or consulting engineer to include a Powers Quality System of Pneumatic Temperature Control. There is none better.

THE POWERS REGULATOR CO.

Skokie, Ill. • Offices in 85 Cities in U.S. and Canada

Western Offices: Los Angeles, 3200 Temple St. — San Francisco, San Diego, Seattle, Portland, Phoenix, Albuquerque, Denver, Salt Lake City, Billings, Montana. Texas—El Paso, Dallas, Houston, Lubbock, San Antonio.

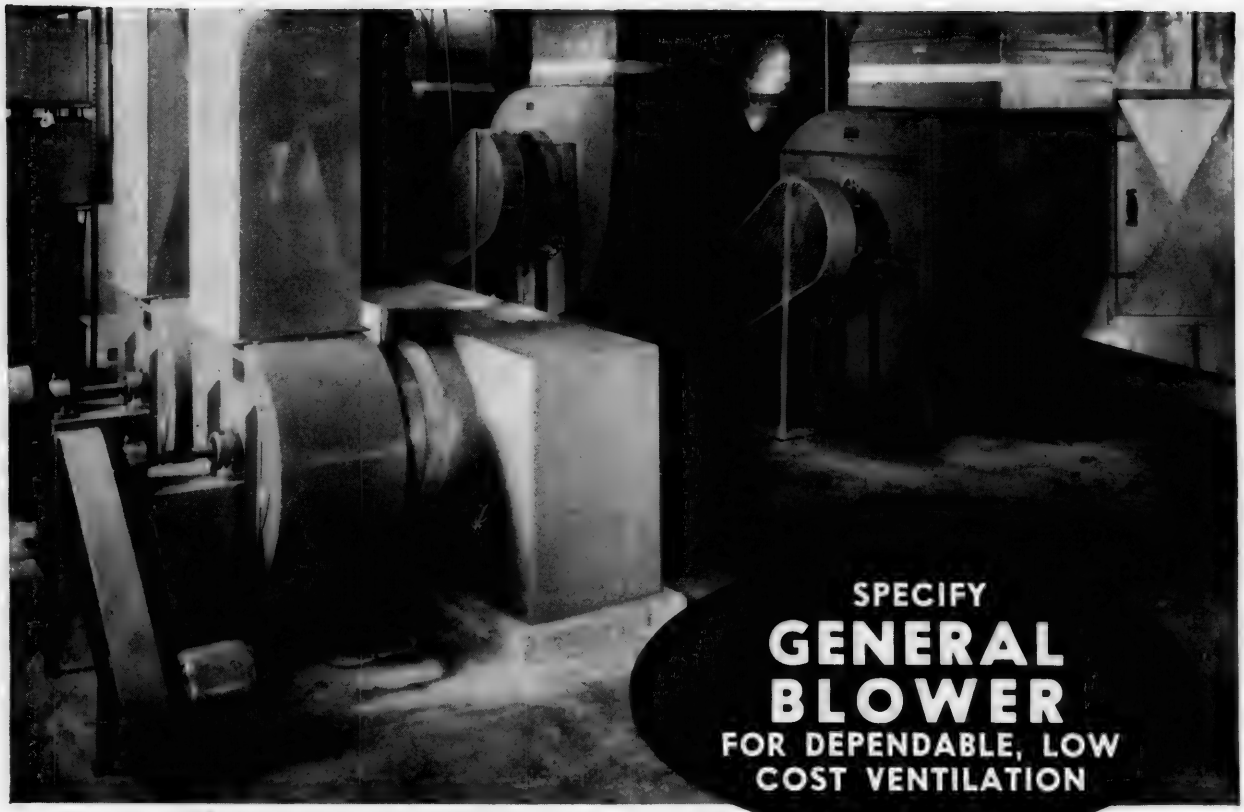
65 years of Temperature and Humidity Control

Scientific Frontiers

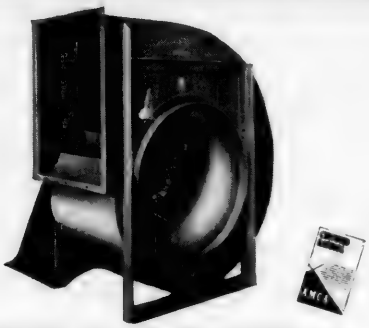
• An Air Force doctor, speaking before the American Association for the Advancement of Science, described experiments to determine man's tolerance to heat pulses up to 500 deg F. As a result of the studies, according to Dr. Paul Webb of the Aero Medical Lab at Wright Air Development Center, Dayton, Ohio, aircraft designers can reduce the amount of heat-shielding previously believed necessary in high-speed airplanes. Scientists had long known that prolonged exposure to 250-deg heat will cause death from heat strokes. And, atomic blasts have provided information on surface burns from brief, intense heats. The studies conducted by Dr. Webb applied high temperatures steadily over a short period. The maximum rate of heating was 100 degrees a minute, which is the highest rate that is expected in an uninsulated space-type craft re-entering the dense air. As soon as the man undergoing the tests felt pain on his exposed skin, the experiment was halted. Dr. Webb reported that nude men began to feel pain when the temperature reached between 350 and 400 deg. Lightly clothed men withstood 450 deg; heavily clothed men scarcely felt the heat until 500 deg was reached. The temperature rise was halted there, however, for fear of igniting the clothing which was heavy Arctic flight gear.

• A pilot plant to convert sea water into fresh water using a new direct-freeze process will be built by Carrier Corporation under a contract with the U.S. Department of Interior's Office of Saline Water. The equipment is designed to produce 15,000 gallons of fresh water a day, according to Cloud Wampler, chairman of the board of Carrier. He reported that the entire pilot plant test program is expected to be complete within 12 to 18 months with the purpose of qualifying the company's process for one of the million-gallons per day production demonstration units authorized by the 85th Congress. The pilot plant is expected to be in operation at the company's Syracuse, N. Y., headquarters by summertime. After preliminary testing there, it will be moved to a seacoast site.

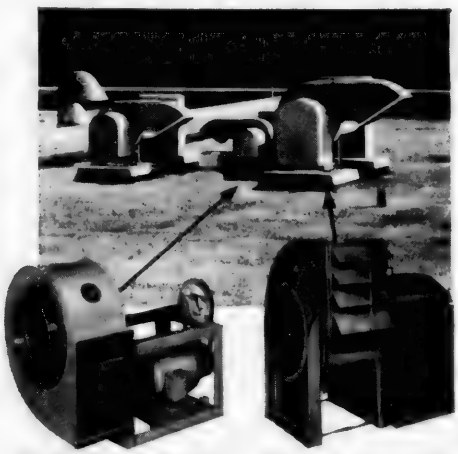
• The large-scale waste calcination pilot plant being built at the Atomic Energy Commission's National Reactor Testing Station, Idaho, represents a major new start in the field of radioactive waste disposal. At present, when used nuclear fuels are removed from reactors and processed to recover valuable fissionable materials for re-use, the highly radioactive and corrosive liquid wastes that result from the solvent extraction process (high-level wastes, as opposed to low-level wastes discussed on this page last month) are stored in underground steel tanks. The new process converts these liquid wastes to solid form, and reduces their volume to about one-seventh of the original bulk. It is hoped that it will also make the waste less corrosive and correspondingly easier to store. The process, called calcination, involves evaporating the water, decomposing the nitric acid to oxides of nitrogen, and converting aluminum nitrate to aluminum oxide. The calcination process yields a granular solid alumina product containing all fission products removed from the fuels except those contained in the dust entrained in the calciner fluidizing air. These latter products are removed by scrubbing and filtration techniques. Since some of the highly radioactive fission products must decay for periods as high as 800 years before they can safely be discharged to water and air, the value of this process which "fixes" the radioactivity in a less mobile form is immediately evident. This type of treatment will not impair the preliminary or subsequent separation of radioisotopes for industrial utilization.



SPECIFY
GENERAL BLOWER
FOR DEPENDABLE, LOW COST VENTILATION



BACKWARD BLADE EXHAUSTER (non-overloading, inclined blade) for ventilating, air-conditioning and heating. 19 Fan Wheel diameters (12¼" to 73") Request Bulletin BB-105.



GENERAL UTIL-A-VENT, JR. Small Exhausters FC Wheels 5-1/2" thru 10-5/8", wheel diameters — Bulletin FP-101.

UTIL-A-VENT SETS — (backward or forward curved) Belted — 12" thru 36" wheel diameters. Bulletin UVS-104.

General Blower Centrifugal Fan Equipment is available for a wide range of engineered air systems, — low- medium- or high-pressure (free air to 41.52 water gauge).

Over 25 years experience, plus modern production methods and fan design assures . . .
Dependability — Economy — High Quality!

CORROSION A PROBLEM?
GENERAL BLOWER OFFERS FANS COATED OR CONSTRUCTED OF ALLOYS

OTHER GENERAL BLOWER FANS

Forward curved* Centrifugal Fans	Bulletin FC101R
New Industrial* Fans	Bulletin 1F100
Dura-Temp Heat* Fans	Bulletin HF100
Turbo Blowers (Pressures to 24 oz. and above)	Bulletin TB109
Propeller Fans — Panel Fans	Bulletin EF-101

(*AMCA Certified Ratings)

Full product data and information available from your local G-B Representative. (See phone listing in your phone directory — all principal cities) or write Dept. B, Morton Grove, Ill.

"Lungs ® for Industry"

General Blower Company
DEPT. B, MORTON GROVE, ILLINOIS

Are You Missing The Profit Parade?

As the chart at right shows, copper drainage tube DWV is being used more and more by wide-awake contractors. Don't let this opportunity slip past you . . . ride the trend and profit. Here are the reasons for that trend:

1. Reports from contractor after contractor show installed cost to be lower than for rustable materials.
2. Every step of installation is quicker, easier.
3. Largest size in 20′ lengths can be handled by one man. Fewer hangers are required.
4. Copper can't rust . . . is virtually impossible to clog.
5. Fewer, tighter joints.
6. 3″ stack fits 2″ x 4″ wall partition.
7. Ideal for prefabrication in shop.
8. Copper is accepted by builders and owners as the badge of quality construction.

JOIN THE PROFIT PARADE NOW! SEE YOUR REVERE DISTRIBUTOR FOR SIZES AND COMPLETE DETAILS OR SEND FOR FREE DATA FOLDER

IN 2 YEARS THE USE OF TYPE "M" AND DWV COPPER TUBE HAS INCREASED 29%

Size	1st Half 1955 Type M	1st Half 1955 DWV	1st Half 1956 Type M	1st Half 1956 DWV	1st Half 1957 Type M	1st Half 1957 DWV
1¼″	2.7	.1	2.1	0.5	1.9	0.7
1½″	4.6	.5	2.9	2.6	2.6	4.2
2″	1.8	.2	1.5	0.8	1.3	0.9
3″	1.8	.5	1.3	1.5	1.1	2.7
4″	0.2	**	0.2	0.1	0.3	0.3
Total	11.1	1.3	8.0	5.5	7.2	8.8
TOTAL	12.4		13.5		16.0	

Distribution expressed in lbs. per Housing Start. **Less than 0.05

Source: U.S. Dept. of Labor

Above table shows results of recent survey made by U.S. Department of Labor on the use of Type "M" Copper Water Tube and Copper Drainage Tube DWV, as determined by shipments. Note that while use of Type "M" has decreased 35%—1957 over 1955, Type "DWV" has increased a phenomenal 575% for the same period.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Ave., New York 17, N. Y.
Mills: *Rome, N.Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.*

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

McQuay "HC" Horizontal heating and ventilating unit. Available in three coil types, standard steam, jet tube steam and hot water.

Flexible for any job
Versatile for any need

THE McQuay LINE OF

HEATING and VENTILATING UNITS

McQuay "HC" heating and ventilating units are the most flexible and versatile available for a wide range of applications, such as schools, churches, hospitals, industrial plants, public and office buildings, and other large area installations requiring quiet, high volume heating and ventilating. They'll handle even the most difficult jobs with ease. Often one McQuay unit will do what normally would require two or more other units. And with McQuay "HC" units come the exclusive Ripple Fin coils and Dura-Frame construction essential to peak performance and economy and quiet, trouble-free operation for years to come. When you have a heating and ventilating problem, call in the McQuay representative or write McQuay, Inc., 1619 Broadway Street N. E., Minneapolis 13, Minnesota.

McQuay "HC" Vertical heating and ventilating unit. Also available in three coil types. A full line of accessories is available for all models.

4 types
19 sizes

1,280 to 48,300 cfm.
26,200 to 2,931,500 Btu./hr.

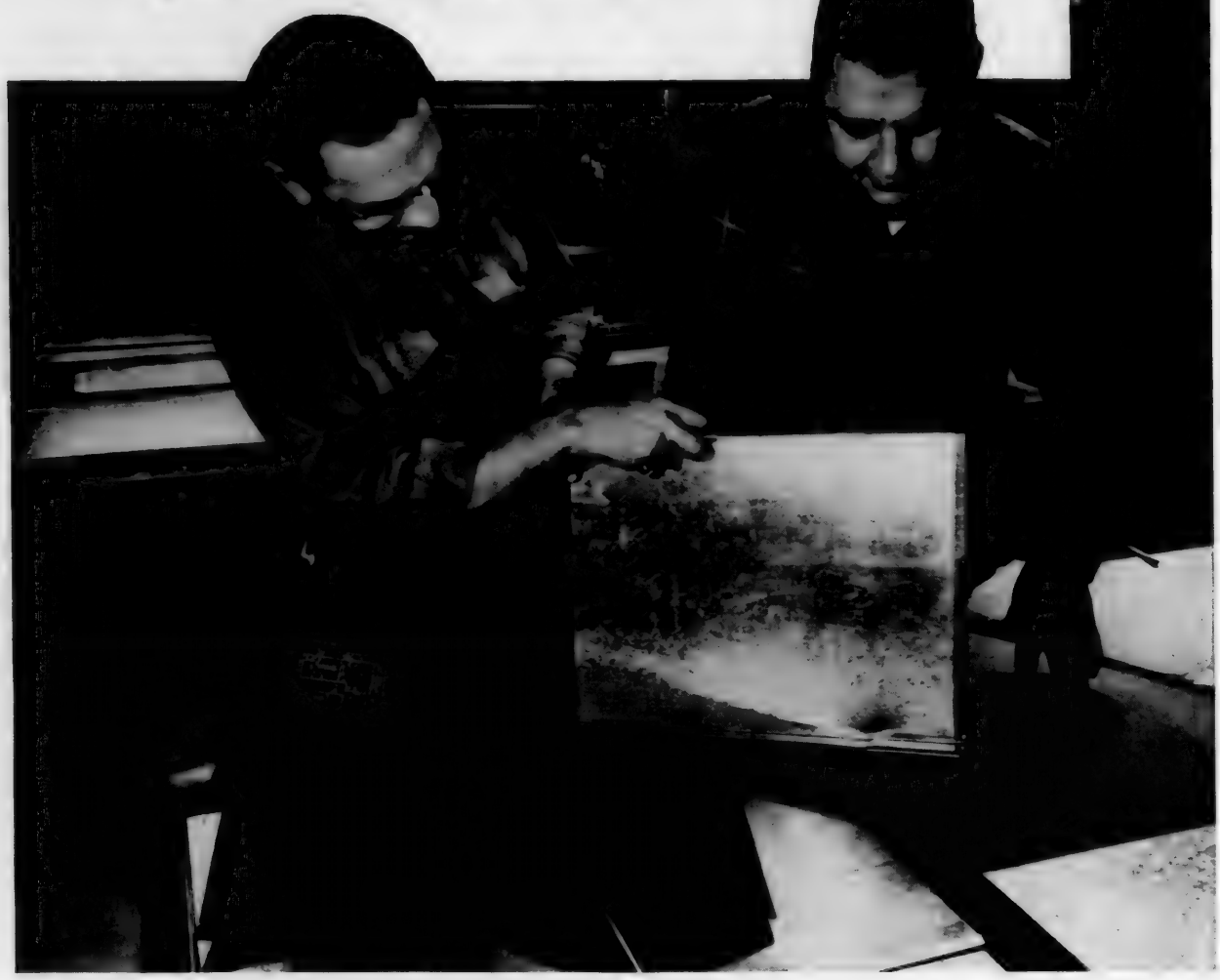
McQuay Means Quality

McQuay units feature the exclusive Ripple Fin coils which create maximum air turbulence and have wide, full fin collars that act as automatic spacers to form a tube around the coil tube for greatest heat transfer and protection. The Dura-Frame "V" channel construction provides the strength and rigidity necessary for quiet, trouble-free operation.

McQuay INC.

AIR CONDITIONING · HEATING · REFRIGERATION

Put a Bethcon sheet through the toughest operation in your shop



You can make snap locks, Pittsburgh lock seams or some special seam of your own without damaging either the zinc coating or the steel base of a Bethcon sheet. That's because Bethcon sheets are galvanized by a continuous process which bonds the zinc to the base metal much more tightly than conventional methods.

SPECIAL ANNEALING IMPROVES DUCTILITY

Another advantage of the Bethcon continuous galvanizing process is the remarkable combination of ductility and strength in the sheet, which stems from the special annealing cycle in the continuous line. You'll find a Bethcon sheet neither too soft nor too stiff, but just right for easy workability and a sturdy end-product. The zinc is distributed evenly over the sheet, so that the finished sheet is uniform in thickness and appearance. And there is no drip end.

You can specify Bethcon in a wide variety of gages, in plain steel or copper-bearing (Beth-Cu-Loy) for extra corrosion-resistance. If you have not yet worked with Bethcon, you might like to talk with someone who has. Or perhaps you'd prefer to discuss it with one of our own men. Either way, you'll get prompt attention by getting in touch with our nearest district sales office.

You really ought to try Bethcon. Why not call us now?

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

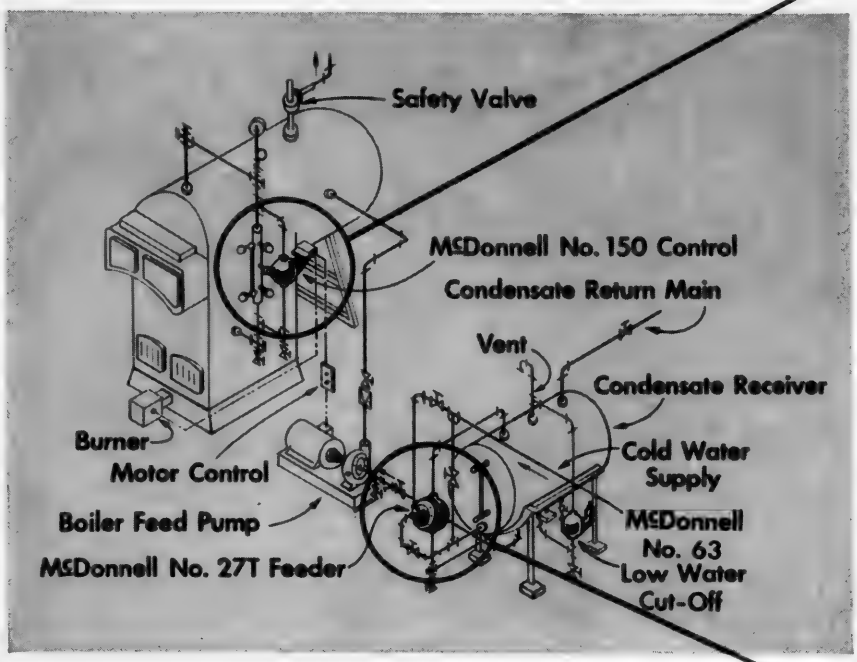
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

End the WATER LEVEL WORR

in those medium pressure boilers

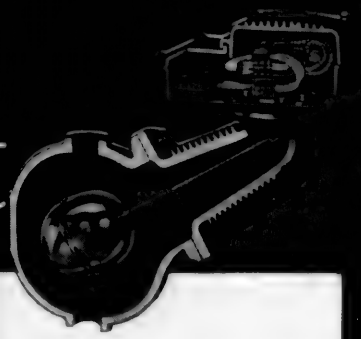


Here's the great combination that takes all the worries and troubles out of water level and feed pump control for the many medium pressure boilers — boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. McDonnell No. 150 controls the boiler feed as it should be controlled — directly from the boiler water level. This holds the water level within the close limits that assure maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the McDonnell No. 27T Make-up Water Feeder installed on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm — a final safeguard from emergency conditions such as current interruption in the pump circuit or failure of make-up supply.

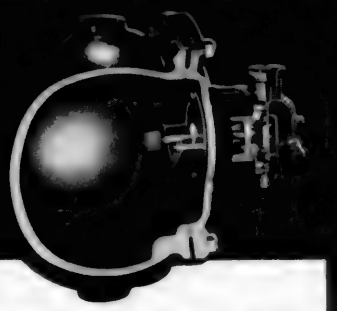
Yes, this is the hook-up that gives you close control of the water level and maximum protection from low water in the broad group of medium pressure plants. Ask for simple installation and wiring diagrams covering every condition.



McDONNELL No. 150
PUMP CONTROL

No. 150 can be used as a pump control, low water fuel cut-off and low water alarm. It has two mercury switches (Underwriters' listed); one for starting and stopping feed pump; the other for low water cut-off of burner and sounding low-water alarm bell if desired.

It has proved its ability in thousands of plants to stand up under the pressures and temperatures encountered in boilers of any size or type with maximum steam pressure, 150 psi. Packless construction is provided by extra heavy monel sylphon — no stuffing boxes to cause trouble. Switch leads have heat-impervious porcelain-bead insulation. Mechanism is sealed from tampering. Other types for higher pressure boilers.



McDONNELL No. 27T
MAKE-UP FEEDER

No. 27T is a float-operated make-up water feeder particularly well qualified for the tough job of maintaining the required water level in receiving tanks.

Large water feeding capacity when water is required, permits the location of the No. 27T at a relatively low point on the receiving tank. This provides adequate space for return condensate, preventing wasteful overflow. Sturdy construction enables it to withstand turbulent conditions so often present in receivers. It is built for tank pressures up to 35 lbs.; water supply pressures to 100 lbs.* Other McDonnell Make-up Feeders, including flange-mounted types are available for practically all needs.

*A further precaution is the McDonnell No. 63 Low Water Cut-off which prevents pump operation in case water supply is interrupted.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL

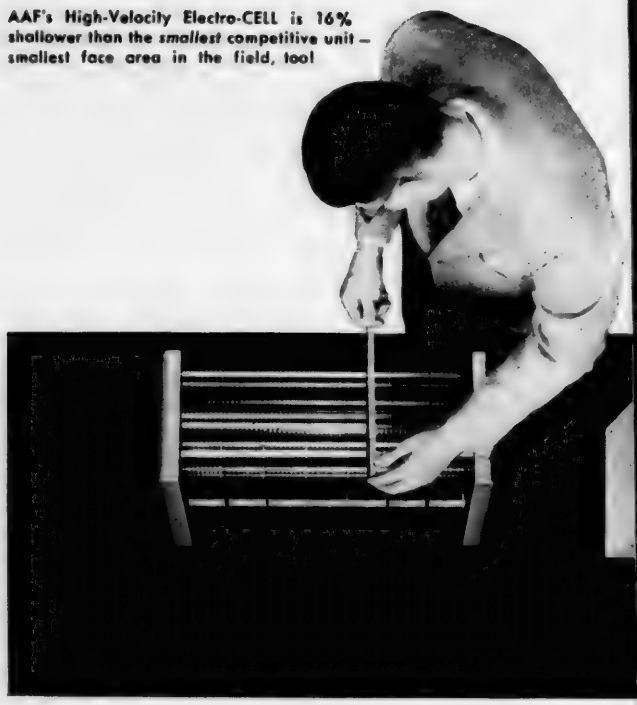
Boiler Water Level Controls

Your Jobber Stocks This

BOILER WATER FEEDERS • LOW WATER FUEL CUT-OFFS • PUMP CONTROLLERS • RELIEF VALVES • FLOW SWITCHES • RELATED LIQUID LEVEL CONTROLS FOR TANKS, STILLS, AIR CONDITIONING SYSTEMS

AAF *Electro*-CELL . .

AAF's High-Velocity Electro-CELL is 16% shallower than the *smallest* competitive unit — smallest face area in the field, too!

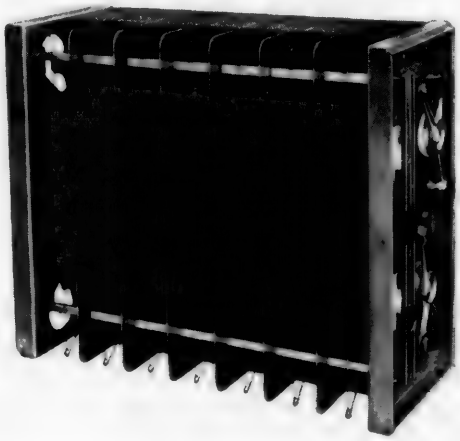


cleaner air
in a smaller package
at lower cost

COMPARE THESE FEATURES WITH THOSE OF ANY OTHER HIGH-VELOCITY PRECIPITATOR

- Does super-cleaning job at higher velocities than any other unit!
- Shallower, smaller in face area. Requires less space than any other high-velocity precipitator!
- Completely automatic maintenance. Automatic washing schedule can be set to meet the needs of each individual job!
- Uses less power than any other high-velocity precipitator!
- Design eliminates by-pass areas within collector cell!
- Precipitator's face area and velocity equal to coil face area and velocity!
- The only electronic precipitator having all insulators out of air stream!
- Only electronic precipitator in which damaged plates can be replaced!
- Any one cell can be removed without disturbing other cells!
- Also available in high velocity, wide-space plate design for heavy industrial service.

. . the only REALLY NEW High-Velocity Electrostatic Precipitator



THIS most recent product of AAF air filtration research is all new—*designed for* high velocity work, not *adapted to* it!

The new Electro-CELL operates at higher velocities — delivers higher efficiency — requires less space (16% shallower) than any other precipitator. And maintenance is a snap. The automatic washing schedule can be set to meet the needs of each individual job.

For complete information, see your local AAF representative or write us direct for Bulletin 258. Address: Mr. Robert Moore, American Air Filter Company, Inc., 294 Central Avenue, Louisville, Kentucky.

AAF **American Air Filter**
BETTER AIR IS OUR BUSINESS

MODERNIZED WITH *MODERN* CAST IRON BOILERS

The outstanding advantages of modern cast iron gas boilers dictated their use in this church property installation. Two Weil-McLain Type "J" Cast Iron Gas Boilers provide the heating for the church, rectory, school and recreation hall.

These units replaced two condemned steel stoker-fired boilers, using only about one-half the space previously required. The system now needs only periodic maintenance, relieving the previous full-time janitor for other duties.

Weil-McLain "Easy-Fit" Headers were installed on the boilers by two men in three hours, saving time otherwise required to fabricate and install a built-up header.

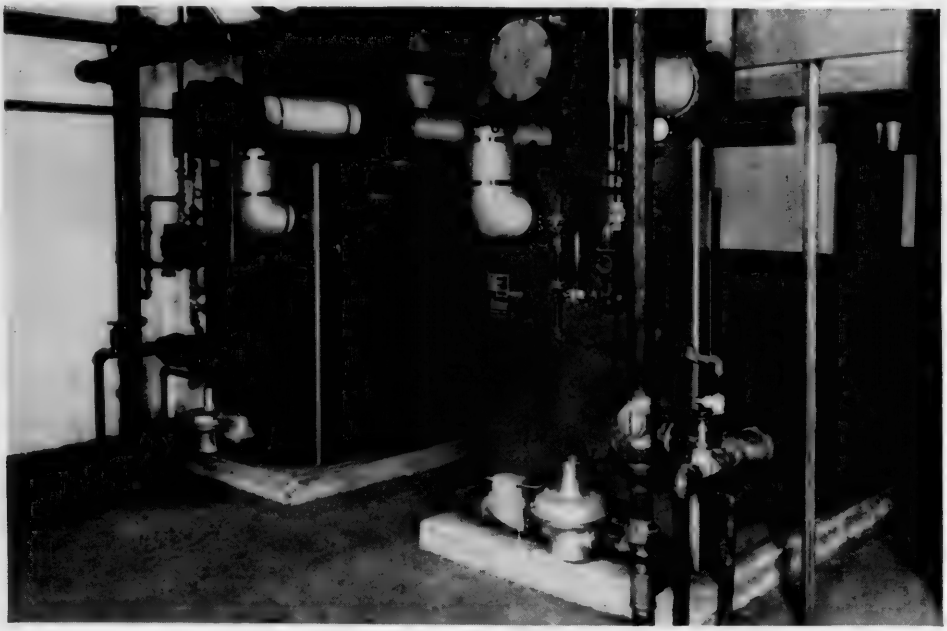
Weil-McLain Type J Boilers offer these features for efficiency, dependability and long life...

1. Made of cast iron, the lifetime metal—impervious to the corrosive effects of condensation.
2. Compact design saves space.
3. Develop full capacity as rated by I=B=R.
4. Can be equipped with latest electronic controls.
5. Can be assembled at any stage of building construction. Sections pass through ordinary door.
6. Capacity easily increased by merely adding sections.
7. Available with dual fuel manifold.
8. Complete access for easy cleaning and maintenance of top efficiency.
9. "Easy-Fit" Headers simplify erection—reduce installation cost.
10. Completely enclosed in handsome enamelled steel jacket, fully insulated.

Church of the Annunciation B.V.M. and School Building, Cincinnati, Ohio

ENGINEERS AND CONTRACTORS:
American Boiler and Radiator Co., Cincinnati, Ohio

DISTRIBUTOR:
Aramac Supply Company, Cincinnati, Ohio



Send for literature on Weil-McLain Type J Gas Boilers or see listing in Sweet's Architectural File. Capacities 625,000 to 5,000,000 A.G.A. Input BTU/hr.

WEIL-McLAIN TYPE "J"

WEIL-McLAIN BOILERS · RADIATORS

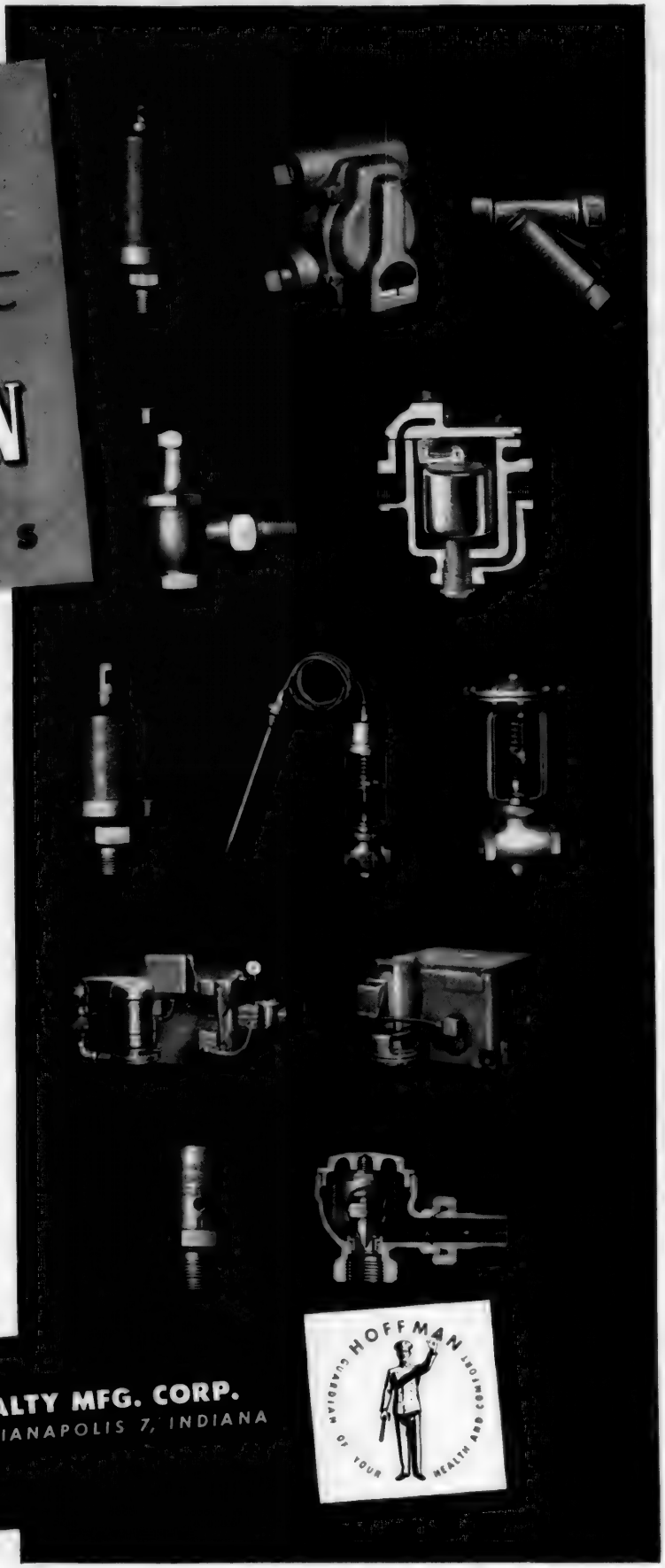
CAST IRON GAS BOILERS

Address literature requests to Weil-McLain Co., Dept. BB-29, Michigan City, Indiana

...for better control of every steam system requirement

HOFFMAN

STEAM SPECIALTIES



Each Hoffman product is distinguished by exclusive features that assure customer satisfaction—long carefree service. For either one-pipe or two-pipe residential or industrial systems there's a Hoffman Trap, Valve, Pump or other specialty designed to give you better control of every requirement. This complete, tested quality line is backed by a dependable, single source of supply and responsibility. Write for complete catalog.

HOFFMAN GUARDIAN OF YOUR HEALTH AND COMFORT

SPECIALTY MFG. CORP.

1700 WEST 10TH STREET, INDIANAPOLIS 7, INDIANA

How a wise plant modernization program produced more effective ventilation:

Hartzell Panel Fans Replace Monitor Windows

Hartzell square steel panel mountings mean real savings on installation costs for many applications. Any standard or Lo-Noise Hartzell propeller in 24", 28", 32", 36", 44" or 48" diameters is available in this type of construction.

When the monitor windows in this large eastern metalworking plant required repairs, they were removed and replaced with Corrulux translucent panels. Twenty-nine Hartzell 44" direct-drive duct fans were installed to give positive, effective ventilation in place of the uncertain, erratic ventilation achieved by natural draft through the old tilting windows. Improved ventilation throughout the building was an immediate result. The fans were installed with motors on the outside so that all maintenance can be handled from the roof.

This installation suggests one of many ways in which Hartzell fans can be used to improve general plant ventilation. If it is adaptable to your plant, you'll find it a highly economical solution. But no matter what your plant ventilation problem, Hartzell has the fan or ventilator to help you solve it . . . and your nearby Hartzell field engineer has the ventilating "know-how" to help you plan the best installation at the lowest possible cost. If you don't know him, drop us a line for his name and address.

This installation was handled by the Hartzell field office at 333 Arch Street, Camden, New Jersey; phone WOodlawn 4-5256.

Why You Can Count on Hartzell Air-Moving Equipment for Long Life Rugged Reliability and Minimum Maintenance

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.

HARTZELL
PROPELLER FAN CO.
Div. of Castle Hills Corp.
55 Thomas Blvd. • Piqua, Ohio

ENGINEERING OFFICES IN PRINCIPAL CITIES

Why do users of READING COPPER TUBE

Repeat and Repeat and Repeat?

Contractors who have ordered Reading Copper Tube recognize its quality as second to none. But they also know that their Reading Distributors get personalized "Shirt-Sleeve Service" from Reading and pass that service along with Reading products.

At Reading, every executive, from the president down, is ready for any emergency request. Red tape is cut and bypassing thru clerks is avoided.

As *specialists,* Reading makes a wide variety of copper tube and stocks it in huge quantities in depots thruout the U.S. As a result, your Reading Distributors can give you exactly the tube you want, exactly when you want it.

Because Reading "Shirt-Sleeve Service" has saved them time, money and headaches, more and more contractors are repeating and repeating and repeating.

On "Shirt-Sleeve Service" you can rely, if READING TUBE you specify!

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

READING TUBE CORPORATION

Empire State Building, New York 1, N. Y. • Plant: Reading, Pa.

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LOS ANGELES, CALIF.
DALLAS, TEXAS
HOUSTON, TEXAS

Sold Through Wholesalers Only

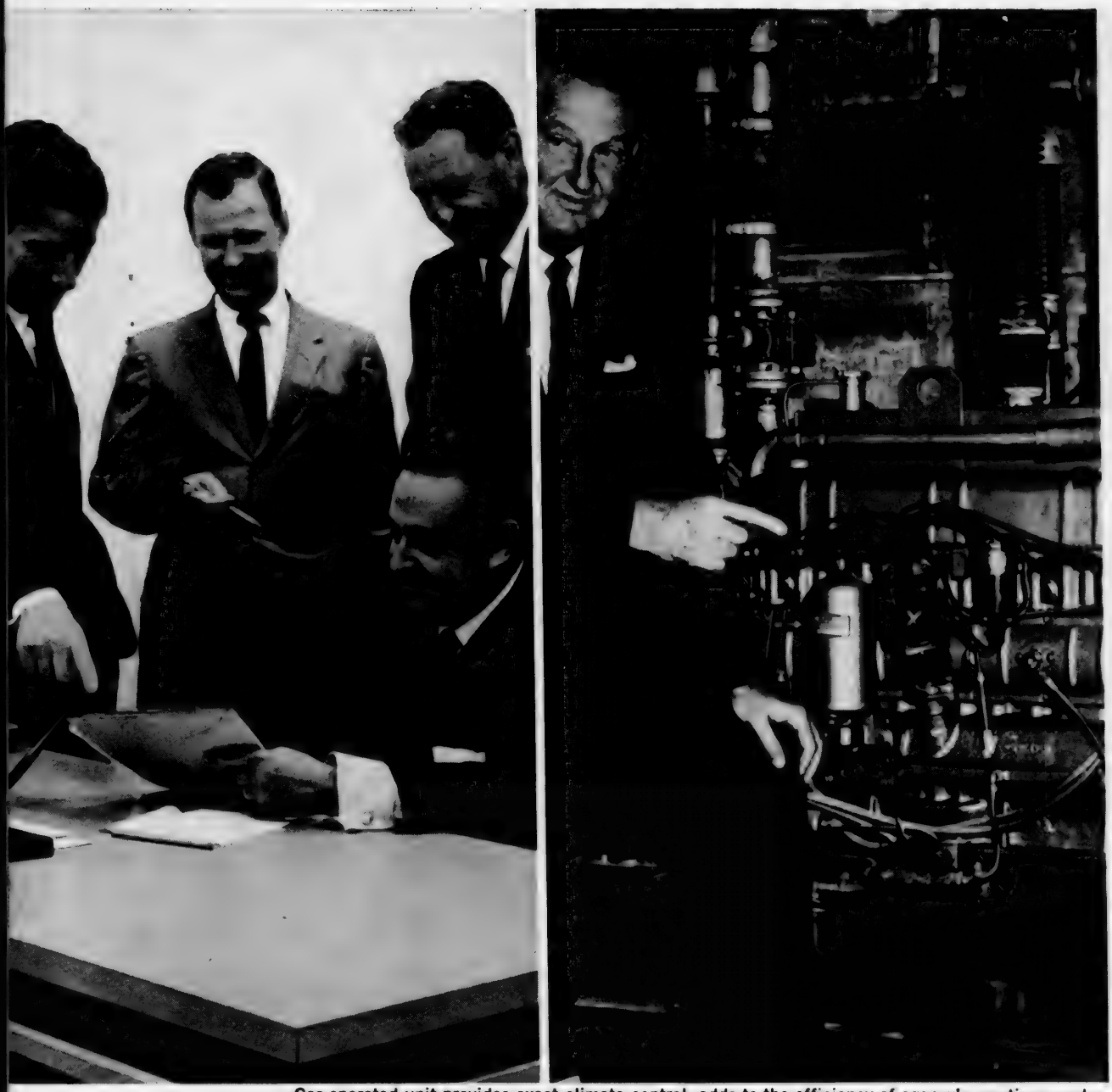
Modern air-conditioned home of Kal, Ehrlich & Merrick, Washington, D.C. advertising agency

"Nothing to do—but enjoy it, with our all-

Says Harry L. Merrick, Sr. President,
Kal, Ehrlich & Merrick Advertising Agency

"Only the best air conditioning system would do for our new building, and experience proves the best is definitely gas", continues Mr. Merrick. "Our Ready-Power air conditioner gives us the exact climate control we want every day of the year . . . and it's extremely inexpensive to operate."

Ready-Power's exclusive variable speed operation offers *constant, precise* control of humidity and temperature without the variations common to on-off systems.



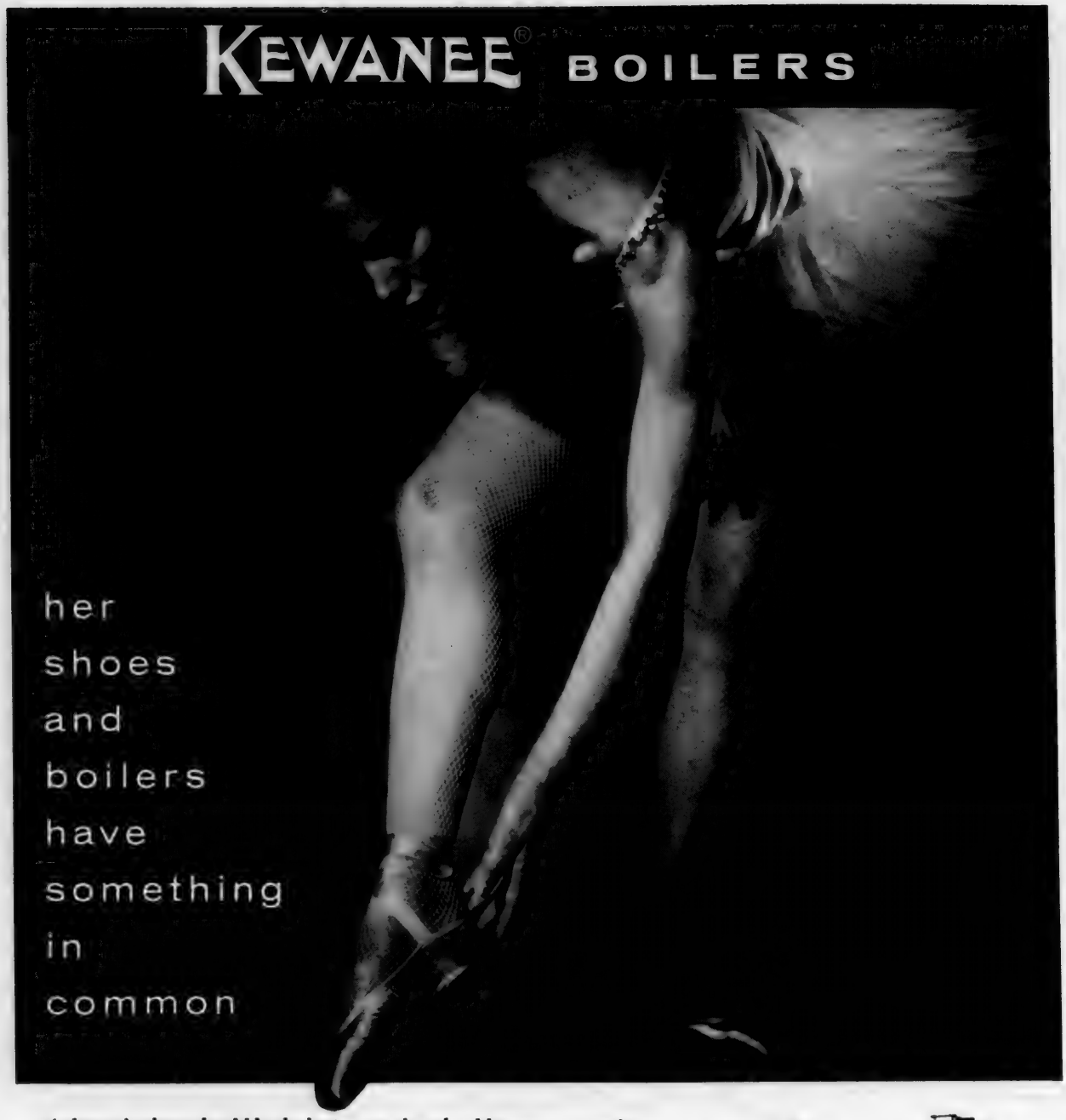
Gas-operated unit provides exact climate control, adds to the efficiency of agency's creative people.

year READY-POWER GAS air-conditioning!"

Because they combine the outstanding economy of gas fuel with automatic metering to match the load on hand, Ready-Power units have the lowest known operating costs . . . *less than a penny per ton per hour!*

For information on how you can benefit by installing modern Gas air conditioning equipment, call your Gas Company's commercial specialist or write to the Ready-Power Company, Detroit 14, Michigan. *American Gas Association.*

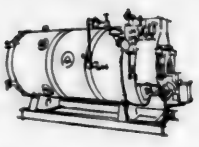
KEWANEE® BOILERS

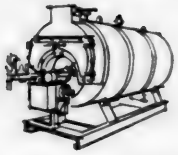


A dancer's shoes should be the best . . . and so should your customer's boilers.

Because so much depends on them, Kewanee Boilers are built to be the best—for capacity, safety and dependability. The fact that they also cost less to operate is an extra bonus. For heat, power or process steam, sell the advantages of Kewanee Boilers—now available in a full range of forced-draft packages. AMERICAN-STANDARD*, INDUSTRIAL DIVISION, Detroit 32, Michigan.

*American-Standard and Standard ® are trademarks of American Radiator & Standard Sanitary Corporation.





NEW 18-651 hp KEWANEE PACKAGES! Just announced, these new scotch type units are available high pressure or low pressure, for oil, gas or combination oil-gas. Write for literature and catalog sheets.

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • KEWANEE PRODUCTS • ROSS PRODUCTS

Free from NIBCO

send today!

This free catalog for 1959 illustrates and gives complete specifications of NIBCO low pressure, pressure rated and special type bronze valves . . . including the sensational new Y-Pattern Globe and Check Valves. These are the valves that give you more shut-offs per dollar . . . fully guaranteed to operate perfectly. See your wholesaler or send coupon below.

VALVE CATALOG VC-3

NIBCO, INC. — Dept. J-6302 Elkhart, Indiana
Please rush free copy of your new Valve Catalog No. VC-3.

Name_____

Firm_____

Address_____

City, State_____

☐ Also send address of nearest source of supply.

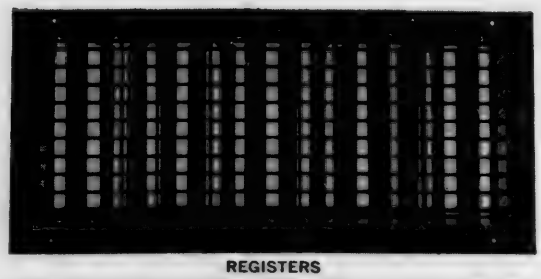
NOW AGITAIR® REGISTERS and GRILLES

(formerly STEWART)

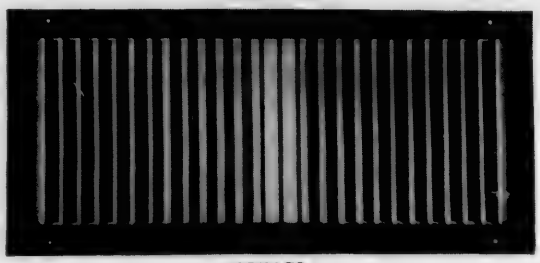
Air Devices Inc., has acquired the complete line of STEWART Registers and Grilles to add to job proven AGITAIR Diffusers, Filters and Exhausters...THERMOTANK High Velocity Mixing Boxes and Punkah Louvres.

Now from one source, Air Devices Inc., you can select with confidence and specify any AGITAIR product and be assured that the item or items selected will meet every performance and architectural requirement.

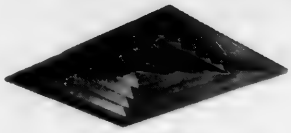
All Air Devices Inc. representatives have practical "on the job" experience in the application of Agitair products. They will gladly assist you in the selection, sizing and application of these products.



REGISTERS



GRILLES



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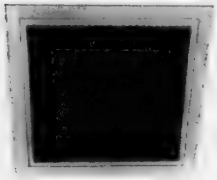
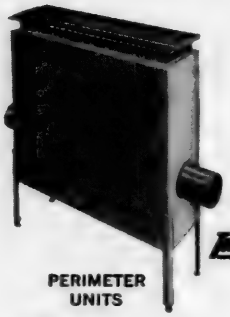
CIRCULAR DIFFUSERS

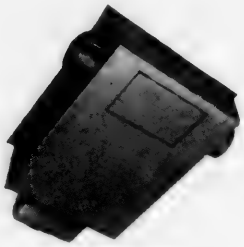
STRIPLINE DIFFUSERS



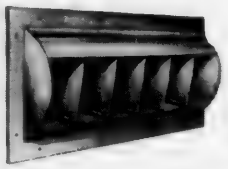
PERFAIR PERFORATED DIFFUSERS



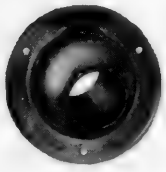
PERIMETER UNITS



CEILING UNITS

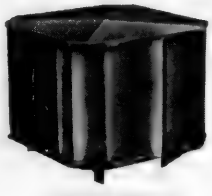


DRUM PUNKAH LOUVRES



ROUND PUNKAH LOUVRES

FILTERS



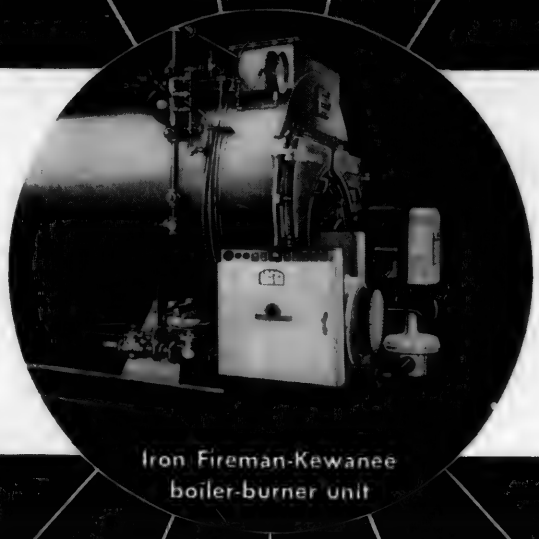
EXHAUSTERS

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

high velocity units • punkah louvers
air diffusers • filters • exhausters
registers and grilles

Screened facade of Stuart Co. plant, Pasadena, California



Iron Fireman-Kewanee boiler-burner unit

Where the *steam* comes from...

for both heating and pharmaceutical processing

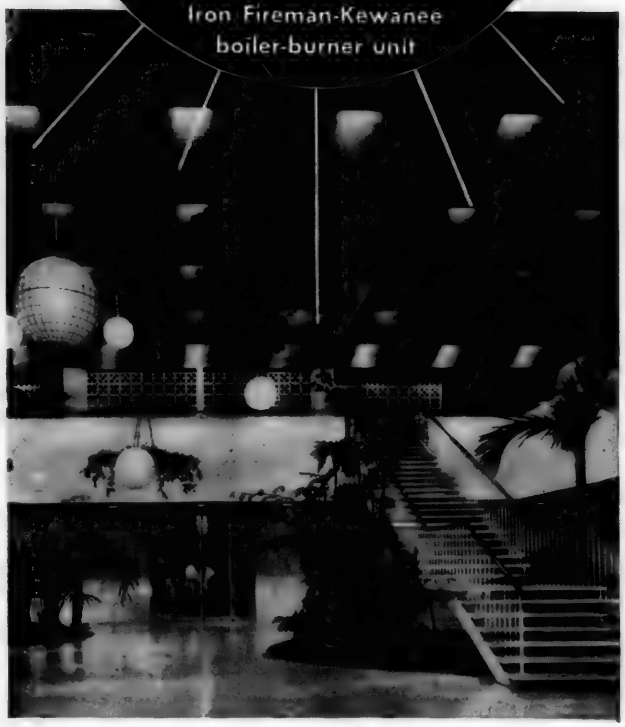
One of the notable commercial buildings of the year combines maximum utility with such striking beauty that it has won nation-wide acclaim. Designed by Edward D. Stone, this plant is used by the Stuart Co. for the production of pharmaceuticals.

Up-to-the-minute mechanical equipment includes two Iron Fireman-Kewanee boiler-burner units. Due to forced draft firing, there is no stack to mar the symmetry of the building. Dual-fuel burners efficiently fire gas or any grade of light or heavy oil, with quick changeover.

Complete Iron Fireman boiler-burner units can be easily sized, specified and ordered from a single catalog, with a single model number.

Conservative rating permits an easy, economical "cruising speed" at rated output, with 50% reserve capacity and consequent minimum noise level and low maintenance costs.

Mail coupon for detailed information and specifications.



Lounge and offices overlook spacious atrium

Architect: Edward D. Stone

Mechanical Engineers: Stockly & Bamford

Mechanical Contractors: Hickman Bros., Inc.

IRON FIREMAN®

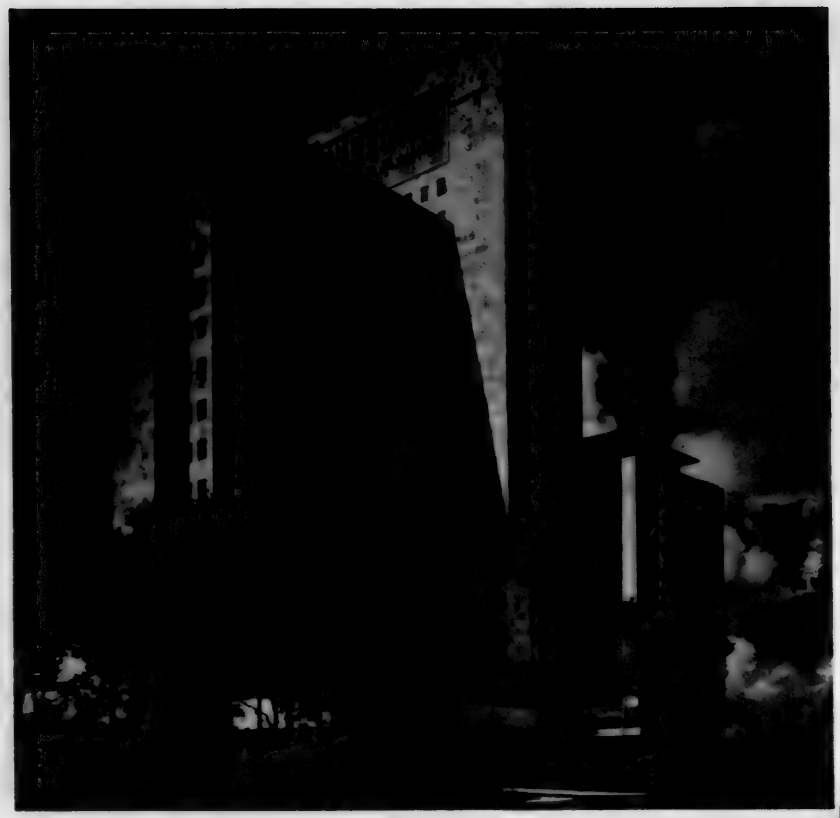
AUTOMATIC FIRING EQUIPMENT FOR HEATING, PROCESSING, POWER

IRON FIREMAN MANUFACTURING CO.
3153 West 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ontario)

Please send catalog and specifications on following equipment:

- ☐ Complete boiler-burner units
- ☐ Forced draft firing unit only

Name.....
Firm.....
Address.....
City.....State.....



Architect: Kenneth Franzheim and Associates, Houston

General Contractor: W. S. Bellows Construction Corporation, Houston

Engineer: Dale S. Cooper and Associates, Houston

Heating and Air Conditioning: Barber, Inc., Houston

Heating and Air Conditioning with

USS National Pipe—

Houston Office
The Prudential Insurance Company of America

A prominent fixture on the Houston sky line is the massive 21-story Houston Office of The Prudential Insurance Company of America. Within this modern structure, Prudential employees enjoy the year-round comfort of a heating and air-conditioning system served by 120 tons of USS National Seamless Pipe in sizes 4" O.D. through 16" O.D.

This is the second of Prudential's efficient new office buildings to rely on National Pipe. The 41-story Prudential building in Chicago used about 200 tons of National Pipe in its air-conditioning, heating and plumbing systems.

Do you need quality pipe for air-conditioning, heating and power installations? Seamless or butt-welded pipe that will pay you back in outstanding service a hundred times over for every dollar you spend for it? Then be sure to say "NATIONAL PIPE." If you'd like further information or immediate assistance with your pipe problems, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS and NATIONAL are registered trademarks

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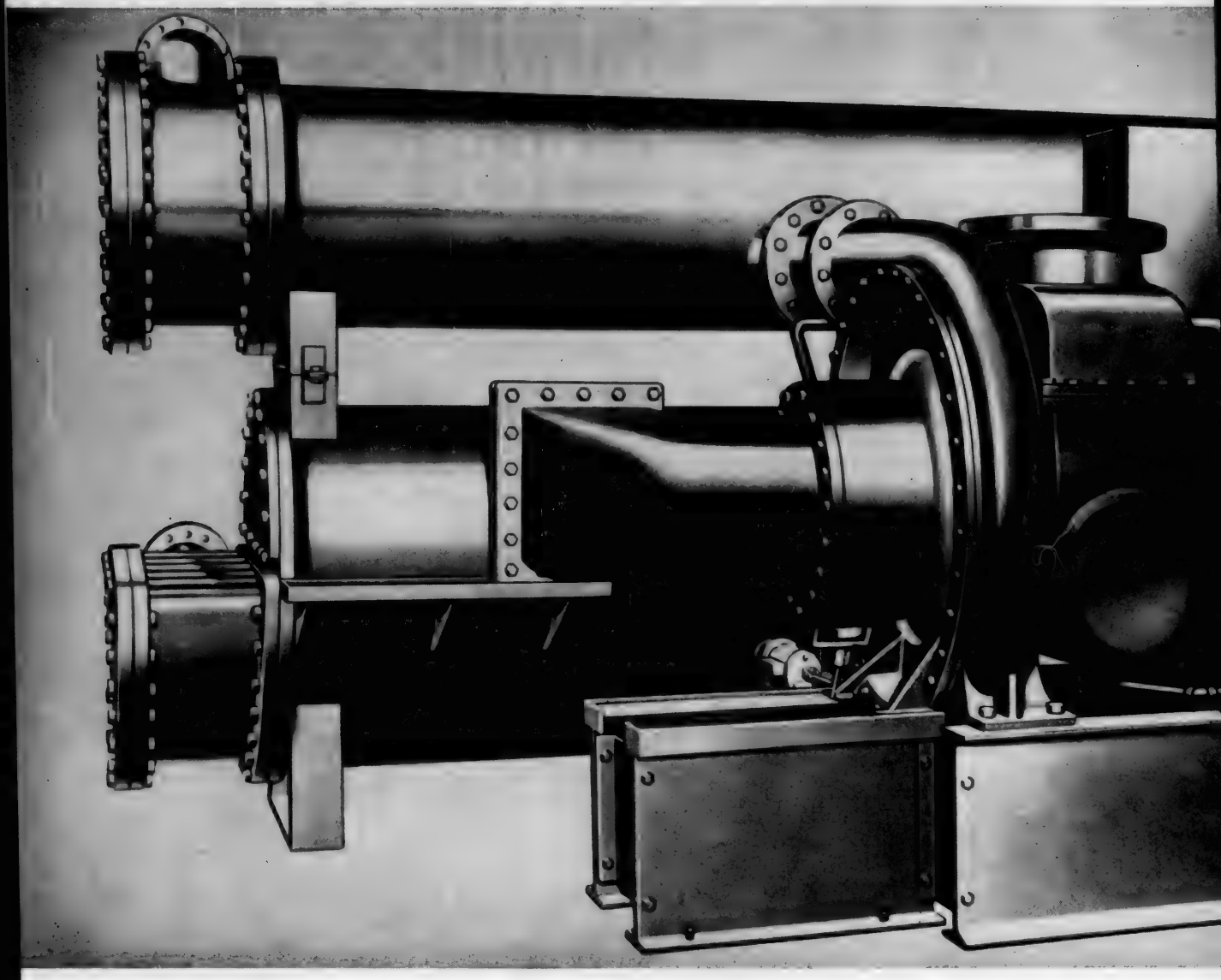
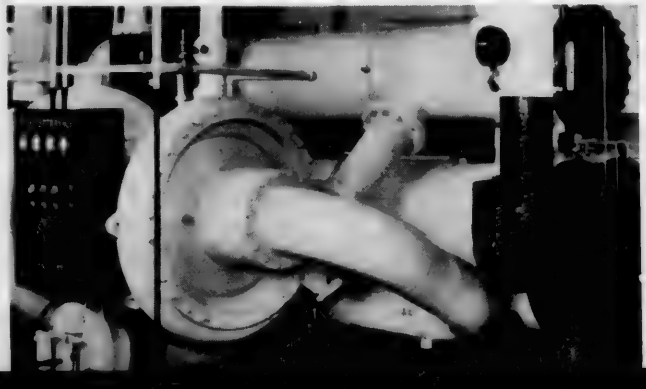
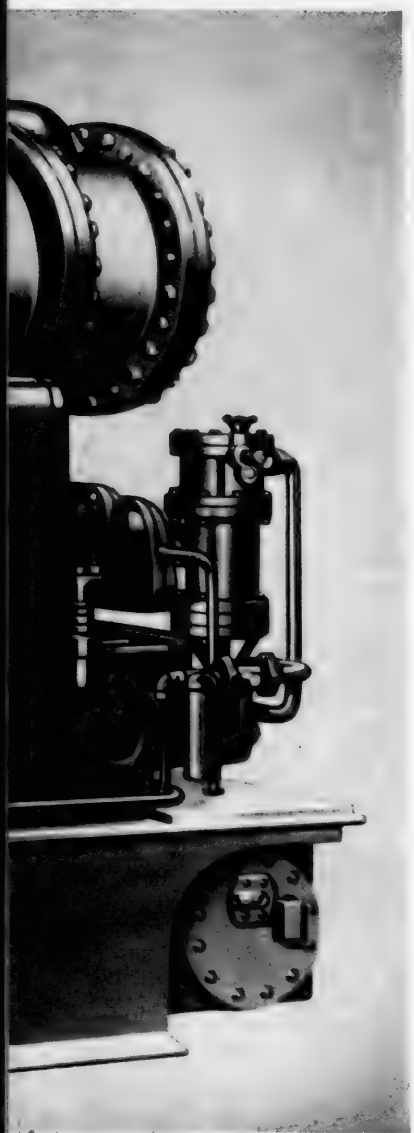


The Turbine CenTraVac reduces refrigeration costs to a minimum . . . brings new savings to plants and buildings where steam is available. Constant speed operation with prerotation vane capacity control improves performance at all part-load conditions. Compressor and turbine factory-assembled on a common base to eliminate field alignment problems. 300 to 1600 tons.

Hermetic CenTraVac water chiller with electric drive has been specified for more installations than all other makes combined! Modulates to 10% of capacity or lower, with power savings in almost direct proportion to load.



A CenTraVac®
steam turbine drive



Now! Lower steam refrigeration costs, simplified installation with the Turbine CenTraVac—300 to 1600-ton water chillers.

Here's the first major advance in twenty years in the field of turbine refrigeration equipment! It's the TRANE Turbine CenTraVac, a centrifugal water chiller that combines the efficient CenTraVac compressor design with steam turbine drive—plus advantages not found in other turbine refrigeration units.

- **More efficient design.** Fewer moving parts. Impeller mounted on extended turbine shaft eliminates thrust and journal bearings.
- **Simplified installation.** Integral assembly of compressor and turbine eliminates critical field alignment problems.
- **Superior seal design.** Only ring collar of shaft seal rotates. Positive separation of oil and refrigerant.

Next time you plan an air conditioning system, consider the dependable TRANE Turbine CenTraVac. It's a complete water chilling system, simple in design, simple to install, quiet and vibration-free. It may be installed on any level surface, with no special bases. Wherever there is a supply of steam, it will provide new economy—with all the traditional quality and dependability of the hermetic CenTraVac.

Want more facts? Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

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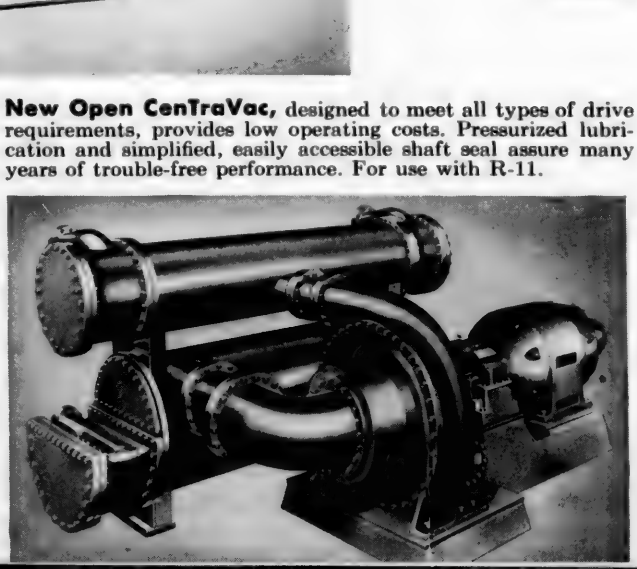
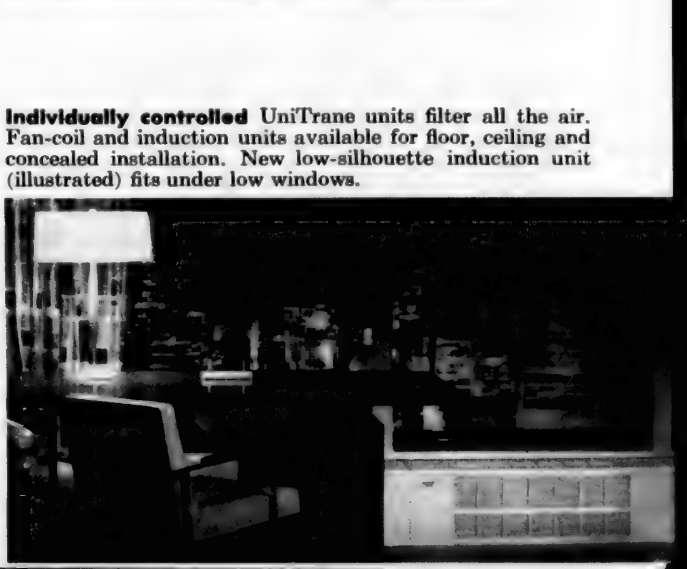
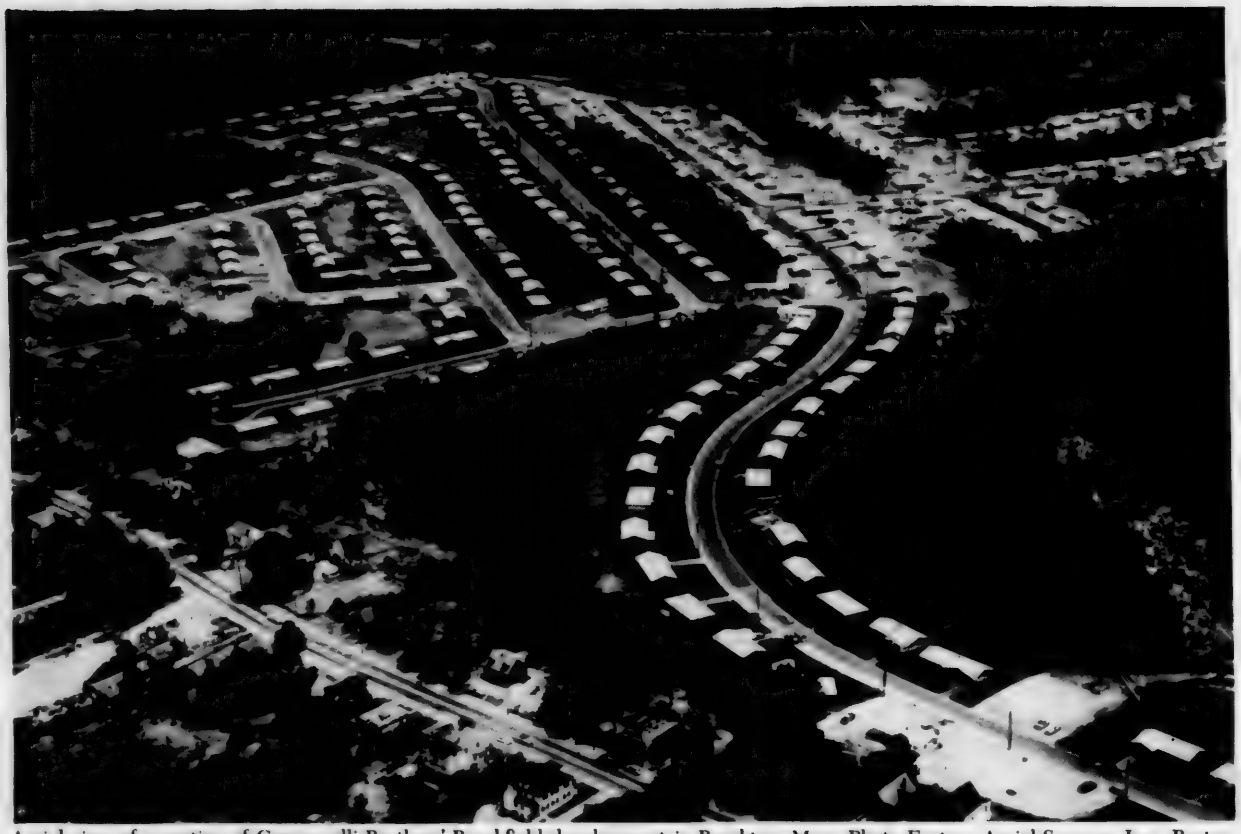
New Open CenTraVac, designed to meet all types of drive requirements, provides low operating costs. Pressurized lubrication and simplified, easily accessible shaft seal assure many years of trouble-free performance. For use with R-11.



Individually controlled UniTrane units filter all the air. Fan-coil and induction units available for floor, ceiling and concealed installation. New low-silhouette induction unit (illustrated) fits under low windows.





Aerial view of a portion of Campanelli Brothers' Brookfield development in Brockton, Mass. Photo Eastern Aerial Surveys, Inc., Boston.

Radiant Heat with Anaconda Copper Tube provides superior value in Brookfield Homes

Paul DiNunno (right), plumbing and heating contractor for Brookfield Homes, reviews a radiant panel heating layout with Edward A. J. Poskus (center), the architectural consultant for Campanelli Brothers, and George Benham, sales representative of The American Brass Company.

One of the outstanding housing projects currently under way in New England is "Brookfield," Brockton, Mass., planned and being constructed by Campanelli Brothers of Brockton. The price range is $12,600 to $17,000.

Top value at lowest cost is the aim of the Campanelli firm. All homes, for example, have radiant panel heating systems using copper tube. And, of course, copper tube is also used for all water lines.

The plumbing and heating contractor for the development is DiNunno Inc., of Brockton. Paul DiNunno, president, says: "The plumbing and heating specifications for 'Brookfield' require the very best of workmanship and materials. I can control our workmanship, but not the quality of materials—and that's why I use Anaconda tube. I know I can depend on every length and coil being of the highest quality. I have used about 350,000 feet on this job to date, purchased from your distributor, the Corcoran Supply Co. of Brockton, Inc."

Try Anaconda on your next job and you will see why Paul DiNunno chose Anaconda. Anaconda Copper Tube is available in all standard wall thicknesses—Types K, L, M and DWV (Copper Drainage Tube)—through your plumbing wholesaler. There is also a complete line of Anaconda solder-joint fittings for every kind of plumbing installation. 3916

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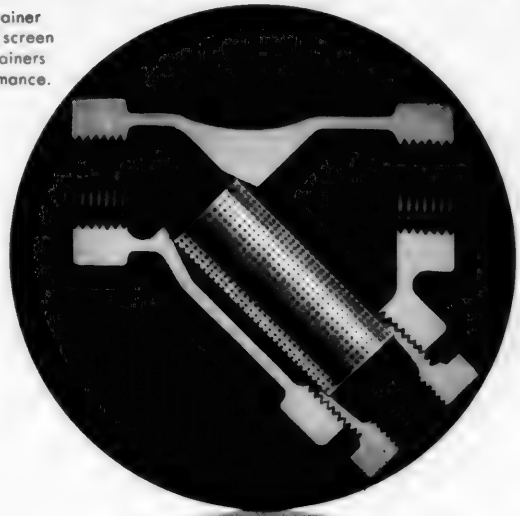
Exterior view of NEW Sarco Type "AT" Pipe Line Strainer. Note 45° blow-down angle to facilitate piping away from strainer.

with this

NEW SARCO TYPE "AT" PIPE LINE STRAINER

Cutaway of NEW Sarco Type "AT" Strainer shows sediment collection chamber below screen. Standard screen used in Sarco "AT" Strainers is key to their uniformly successful performance.



Examine one of the new Sarco Type "AT" Strainers and you'll notice at once that its design is a marked improvement over that of contemporary strainers . . . in three important ways:

The Sarco screen, key element of the unit, fits tightly into a long, tapered screen seat. This feature absolutely stops the by-passing of particles around the screen. Secondly, the rigid, welded construction of heavy-gauge brass makes sure the fit will remain tight, even when trapped sediment builds up pressure.

Third, you'll see that the new AT is easy to clean. No sharp edges or weave crevices in the screen for particles to cling to. Blow-down cleaning is simplified by the 45° angle construction.

Write for Sarco Bulletin No. 1210B which gives dimensions, capacities, and technical data. 7317-B

NOTE THIS ADDED PROTECTION AND CONVENIENCE

1. Bodies of heavy-duty 250 psi semi-steel. Tensile strength to 30,000 # per square inch minimum.
2. For maximum strength, bodies are reinforced with external rib.
3. Long, tapered screen seat assures correct screen position and tight fit without buckling.
4. Cap design provides a sediment collection chamber below screen.
5. Generous proportion of open screen area in relation to pipe size minimizes pressure drop.

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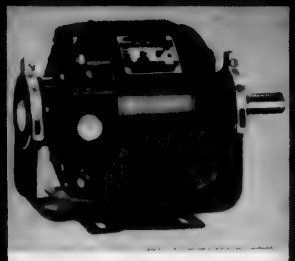

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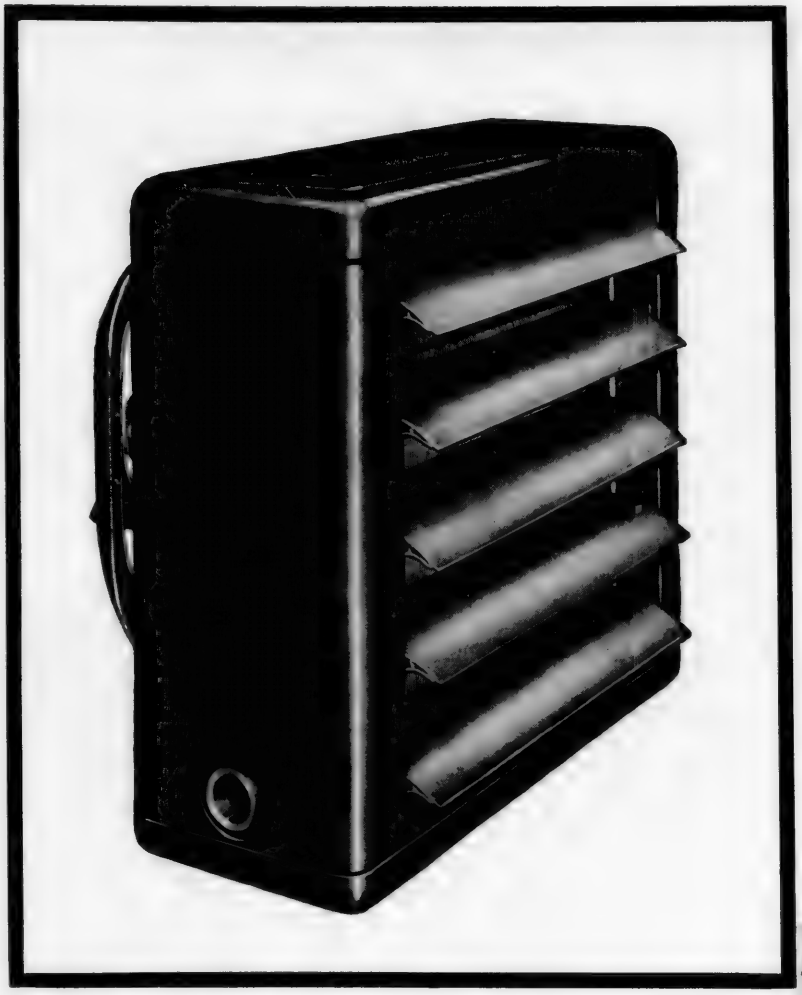

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Best of all, *leakage inside the unit is positively eliminated.* A one-piece, seamless copper tube extends from inlet to outlet ground joint. This provides absolutely leak-tight operation for steam pressures up to 250 pounds and 406° F. Special coils for higher pressures and temperatures can be furnished, on application, utilizing steam or hot water.

Other Breezo-Fin features include high-efficiency fans for quiet operation — streamlined, handsome appearance — fins designed for maximum radiation — sturdy construction for long, maintenance-free life — adjustable louvers to "spot" the heat exactly where it's needed. Available in 31 standard sizes from 16.000 to 497.000 BTU. Special larger packages also available for higher heating loads.

Be sure to investigate "Buffalo" Breezo-Fin Unit Heaters for *your* next "spot-heating" job. Contact your nearby "Buffalo" engineering representative, or write us direct for Bulletin 3137-E.

One of many "Buffalo" Breezo-Fin Unit Heaters installed in world's largest surgical dressings plant, equipped with special coils operating on 425° F hot water with 400 P.S.I. working pressure.

"Buffalo" products bring you the "Q" Factor—the built-in QUALITY that provides trouble-free satisfaction and long life.

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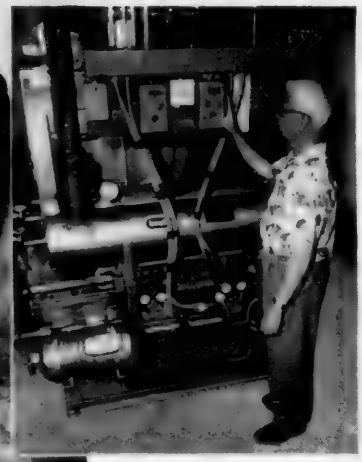
Architect—Charles Faust
Consulting Engineer—George C. Ray
Contractor—Callahan Brothers —Bossert Sheet Metal
Wholesaler—Refrigeration Supply Distributor

Penguin Pavilion at San Diego Zoo. The pool is 55 feet long and 6 feet wide with depth varying from two feet to five feet. Here visitors may view the colony of penguins swimming or watch them in natural surroundings on the upper level.



A Heat-X 'PC' was selected because of its patented Inner-Fin construction, which greatly increases heat transfer efficiency and conserves vital space.

. . . IN SAN DIEGO

Penguins commonly observe formality... but that's not why lovely Dee Ann Fleming, Miss San Diego, is getting the cold shoulder here.

She's toe-testing water in the modern new penguin pool at the San Diego Zoo . . . water which efficient Dunham-Bush equipment maintains at the relatively polar-like temperature level of 50-60 degrees.

Not unexpectedly, the major demand here was for a balanced, livable environment—by penguin, not human, standards. And Dunham-Bush units—specifically a Heat-X 'PC' Package Chiller and two BC 1000 Remote Air Cooled Condensers—created climatic conditions which exactly duplicate those the penguin enjoys in his habitat.

To keep the birds comfortable while paddling in the pool or padding along poolside, a 30,000 gallon storage tank was installed; and the large concrete exhibition pool with surrounding promenade deck was set inside the tank. Both pool and deck are cooled by constant, direct contact with the tank's Heat-X 'PC' chilled water.

This installation is another convincing demonstration that Dunham-Bush repeatedly is called upon when the need is for product adaptability and reliable performance. Check with Dunham-Bush before your next air conditioning, refrigeration, or heating job.

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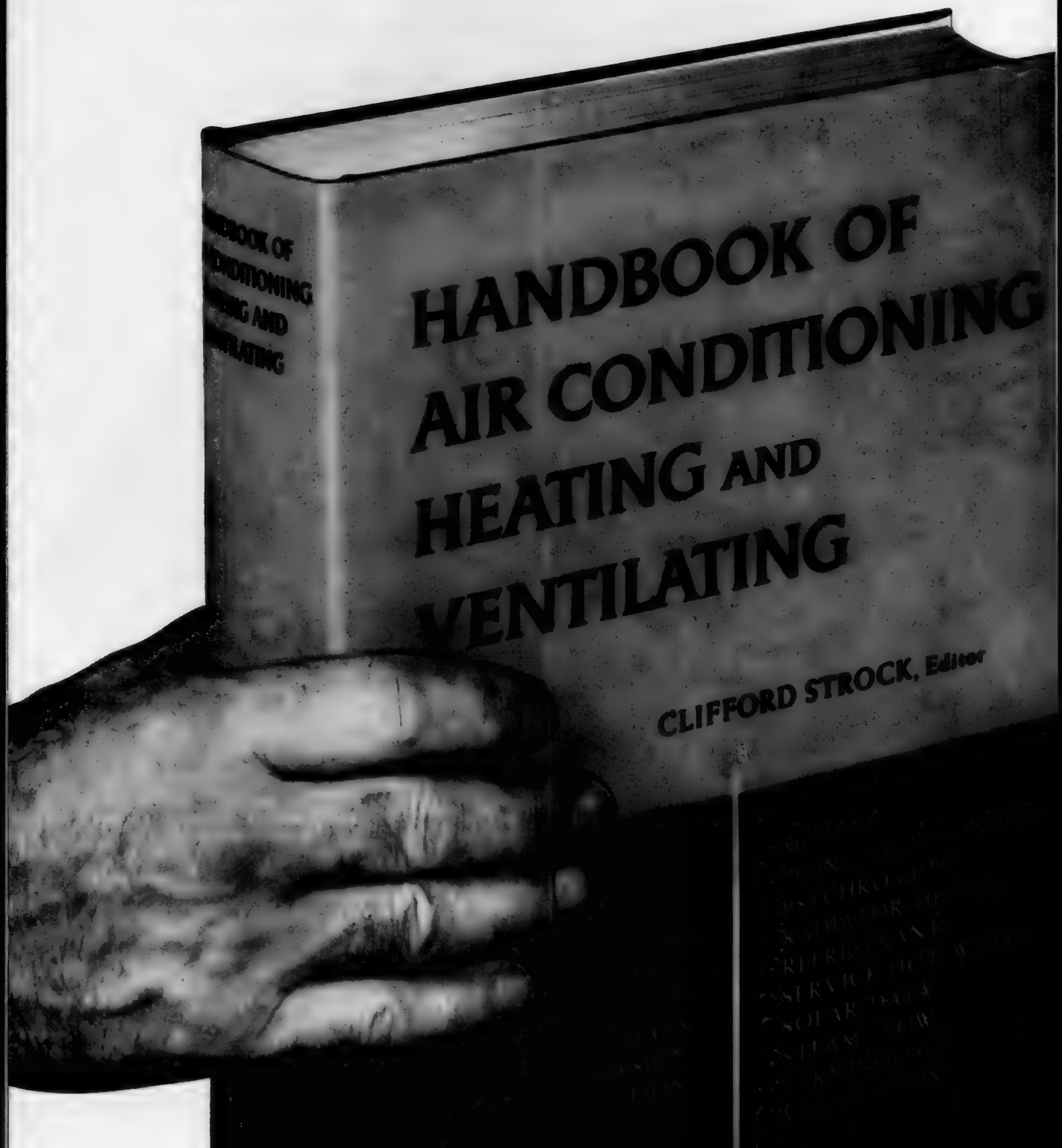
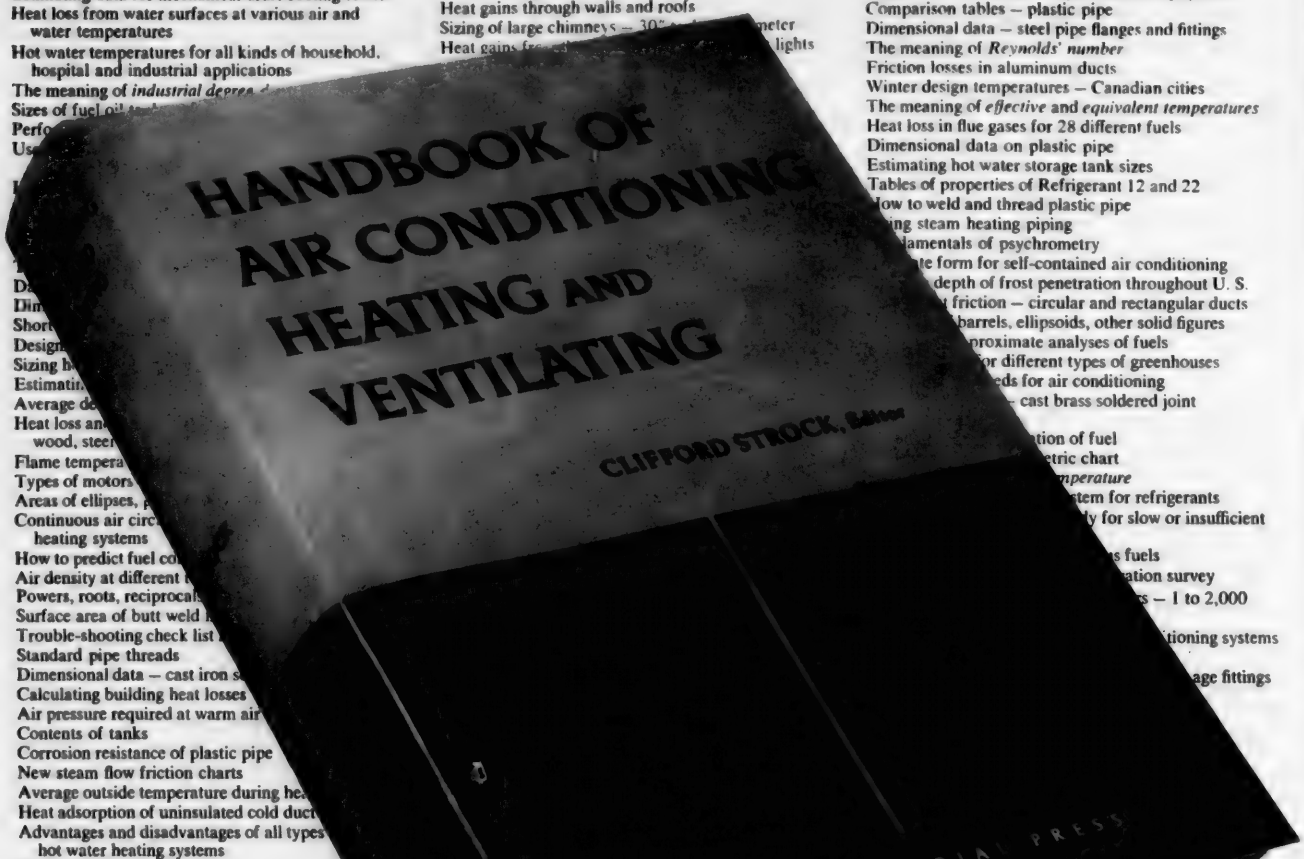
Here it is!

READ DETAILS OF THIS GREAT NEW HANDBOOK ON NEXT THREE PAGES





Estimating data for air conditioning
Dimensional data – wrought copper and bronze joints
Pounds of flue gases for perfect combustion for all kinds of fuels
Sizing refrigerant pipe lines
Heat gains from human beings
Insulation to prevent sweating on cold pipes
Normal yearly degree-days for 877 U. S. cities
How to use psychrometric tables
Blower sizes for warm air heating equipment
Estimating data for mechanical draft cooling towers
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Hot water temperatures for all kinds of household, hospital and industrial applications
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Sizes of fuel oil
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Heat adsorption of uninsulated cold duct
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Estimating sewage quantities
Arithmetical and geometrical progressions
How to select hot water supply systems
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Register temperatures in warm air heating
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Heat loss from copper tubing
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Step-by-step procedure in duct design
Cooling degree-days – a degree-day unit for estimating summer air conditioning needs
Equivalent resistance of valves and fittings in terms of lengths of straight pipe
Required air volume in a heating or cooling system
Psychrometric chart applicable to barometric pressures to 8,000 ft. above from 8,000 ft. below sea level
Short-cut preliminary cooling estimates
How to use a slide rule
Surface area of flanged fittings
How to test exhaust ventilating systems
Effect of enclosures on radiator heat transmission
The meaning of *Clo* and *Met*
Heat gains through walls and roofs
Sizing of large chimneys – 30"
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Volume flow in pipes and tubes
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Layouts and hook-ups of fuel oil storage tanks
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Angles of sliding for various coals
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Sizing steam heating piping
Fundamentals of psychrometry
Estimate form for self-contained air conditioning
Maximum depth of frost penetration throughout U. S.
Friction – circular and rectangular ducts
Cylinders, barrels, ellipsoids, other solid figures
Ultimate analyses of fuels
Sizing for different types of greenhouses
Load factors for air conditioning
Dimensional data – cast brass soldered joint
Combustion of fuel
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Dew point temperature
Piping system for refrigerants
Remedy for slow or insufficient
Heating fuels
Ventilation survey
Powers, roots, reciprocals – 1 to 2,000
Trouble-shooting systems
Standard pipe fittings
Number of hours an intermittent automatic heating plant operates in a normal year.
Draft required for burning coal
Heat loss from steam piping – pounds of steam per hour
Winter design temperatures – 220 U. S. cities
Friction losses in duct elbows and fittings
Cold water requirements for homes, buildings, theaters, restaurants, etc.
Solutions of equations
Heat loss through heated floor slabs
The meaning of *eupatheoscope*
Air conditioning equipment maintenance schedule
Mixing of hot and cold water
Maximum attainable draft per foot of chimney
Ignition temperature of fuels
Radiation from warm surfaces to cold ones
Color codes for pipe lines
The meaning of *pH*
Standard drafting room symbols for air conditioning, heating, ventilating, valves, piping and plumbing
What the flue gas analysis means
Water requirements for various domestic animals
Graphs to determine apparatus dew point
Balancing air flow in air conditioning systems
Preventing spontaneous combustion in coal piles
Heat gains from gas and electrical appliances
The meaning of *decibel*

A Comprehensive Handbook Made for *Your* Needs *Today!*

AFTER YEARS of painstaking preparation, the new *HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING* is ready – a big, completely new book that has been designed to give you the kind of information you need and use almost daily . . . and to present it in the most convenient, time-saving manner.

It's a big book! The large 7¾" x 10¾" page size makes text, tables and other data easy to read; and – most important – permits the use of large-scale charts from which you can obtain accurate results directly. Tables also are set in large, easy-to-read type. You'll save hours of time with these features alone! Throughout the book, care and thought have been given to the best manner in which to present the information so that it will be most useful . . . most convenient . . . most understandable. Charts, tables, graphs, maps, illustrations are used on almost every page – over a thousand of them appear in this 1,094-page book – and explanatory text has been kept to a minimum.

THE HANDBOOK covers all the major areas of air conditioning, heating, ventilating and related functions. It is divided into eight main sections, each of which is indexed separately. These eight sections are:

1. Air Conditioning
2. Air Handling and Ventilation
3. Fuels and Combustion
4. Heating and Heat Transfer
5. Piping and Plumbing
6. Motors and Motor Starters
7. Mathematical Data and Drafting Room Symbols
8. Terminology

In addition, a complete cross-index enables you to locate any item of information quickly, even though you are not sure under which category it would fall.

At the left is a partial list of typical subjects covered – literally thousands of facts, all quickly, easily accessible in one convenient volume.

FACTS FROM THE FIELD'S FOREMOST AUTHORITIES

To obtain such a wealth of material on such a variety of subjects, the experience of experts in every field has been drawn upon. Well-known authorities have contributed their knowledge, as well as the results of their costly research and special studies. All this information, plus a great deal of his own original work, has been coordinated by Clifford Strock, Editor of AIR CONDITIONING, HEATING AND VENTILATING. His unique combination of experience both in the field and behind the editor's desk gives him the knowledge and judgment to know what to select, what to reject, and how to present the data in the most convenient, most usable manner.

PAGE AFTER PAGE OF INFORMATION NEVER BEFORE PUBLISHED

Page after page of tables, charts, graphs and maps in *THE HANDBOOK* present data never before available in such convenient form. For example, complete data on heat loss from insulated pipe are given in terms of nine different k values, rather than in terms of just one standard type of insulation. A complete range of pipe sizes is covered in these tables, so that knowing the pipe size and the k value of the insulation you can obtain a direct answer that does not require conversion from one type of insulation to another.

Another example: tables giving heat loss through glass as well as by infiltration are given for every standard type and size of wood, steel and aluminum window, weatherstripped and non-weatherstripped. Drawings illustrate the construction features of each window, enabling you to locate the data you need about a particular type quickly.

THE HANDBOOK includes degree-day data, in both tabular and map form, for 1,228 localities in the U. S., including Alaska, as well as 42 cities in Canada, plus a comprehensive discussion of the ways in which you can use this information.

In addition to the degree-day maps, the most complete collection of climatic maps ever published in this field give other essential data such as design temperatures; sunshine; humidity; snow; number of hours that temperatures reach 80, 85 and 90 deg.; year-round sun angles for various latitudes, etc. Here again, the large page size of *THE HANDBOOK* makes these maps easy to interpret.

There are but a few examples of the kind of information you will find in the *HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING* – practical, clear, useful data that will save you hours of costly time . . . insure money-saving accuracy in your calculations.

The questions that come up in your work are becoming more complex, more numerous every day. Only a handbook that is completely new that has been edited with *your needs today* in mind, can give you the answers to many of these questions. See for yourself how many ways you will be able to put *THE HANDBOOK* to work for you.

THE HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING will become the *most used book* that you own. Start putting it to use now!

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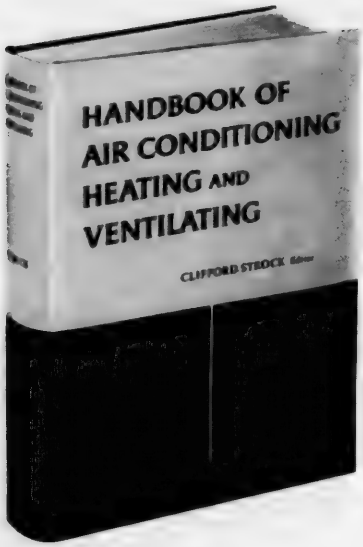
You'll Use Your HANDBOOK Dozens of Times a Day to Find Information on All These Subjects



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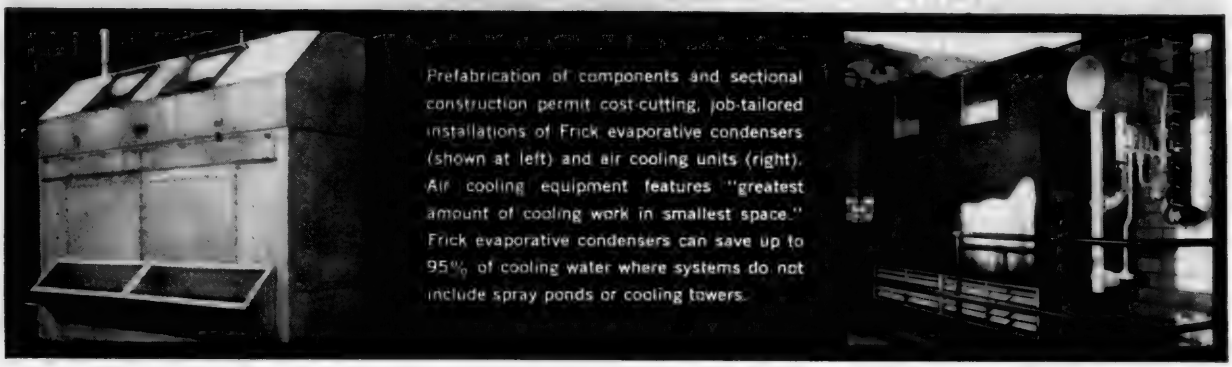
How Fafnir Ball Bearings simplify design and assembly for Frick



Prefabrication of components and sectional construction permit cost-cutting, job-tailored installations of Frick evaporative condensers (shown at left) and air cooling units (right). Air cooling equipment features "greatest amount of cooling work in smallest space." Frick evaporative condensers can save up to 95% of cooling water where systems do not include spray ponds or cooling towers.

When designing-in fan shaft bearings for their air cooling units and evaporative condensers, Frick Company wanted positive protection against moisture. Fafnir Wide Inner Ring Ball Bearings with Plya-Seals not only afford a built-in answer, but meet several other design needs as well. ✓ ✓ ✓ For example, the patented, contact-type Plya-Seals do double duty. Besides providing the best protection yet against moisture and other contaminants, they also prevent loss of factory-packed lubricant . . . thus cutting maintenance to a minimum. Assembly costs are cut, too. Bearings slip-fit onto shafts and are locked into place with a twist of Fafnir-originated, eccentric cam design, self-locking collars. No machining, no mounting devices needed. Moreover, wide bearing design assures ample support for the extra-heavy shafts. ✓ ✓ ✓ Such job-right applications make Fafnir a leading supplier of ball bearings for refrigeration, air conditioning, heating, and ventilating equipment. It adds up to experience that can pay off for you! The Fafnir Bearing Company, New Britain, Connecticut.

Fafnir Wide Inner Ring Ball Bearing with Plya-Seals. Flared, Buna-N rubber-impregnated fabric seals ride in constant contact with ground inner ring. Seal back-up shields, mounted in close clearance with inner ring, provide baffle for grease; prevent seal push-in. Bearing is prelubricated, relubricatable.

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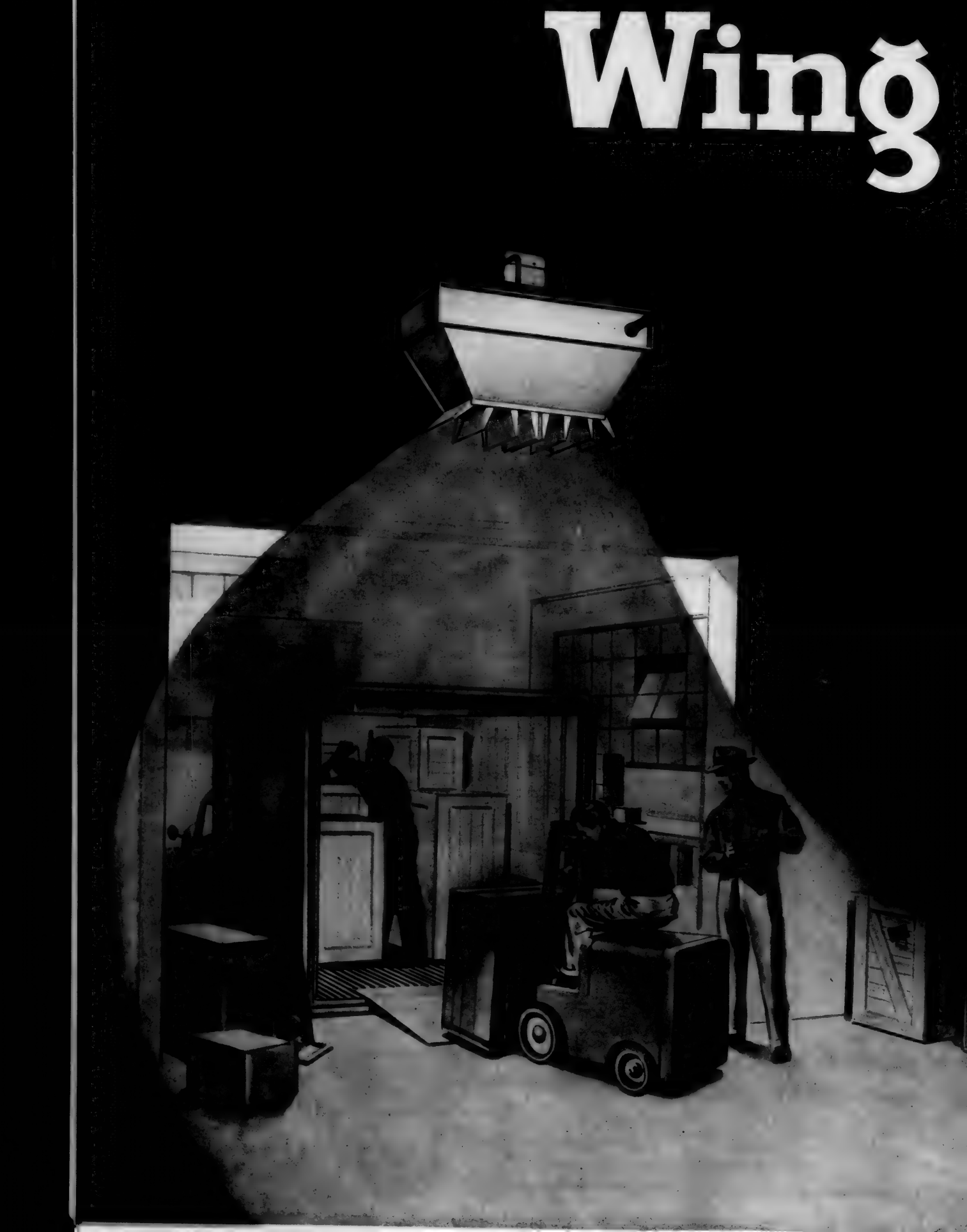

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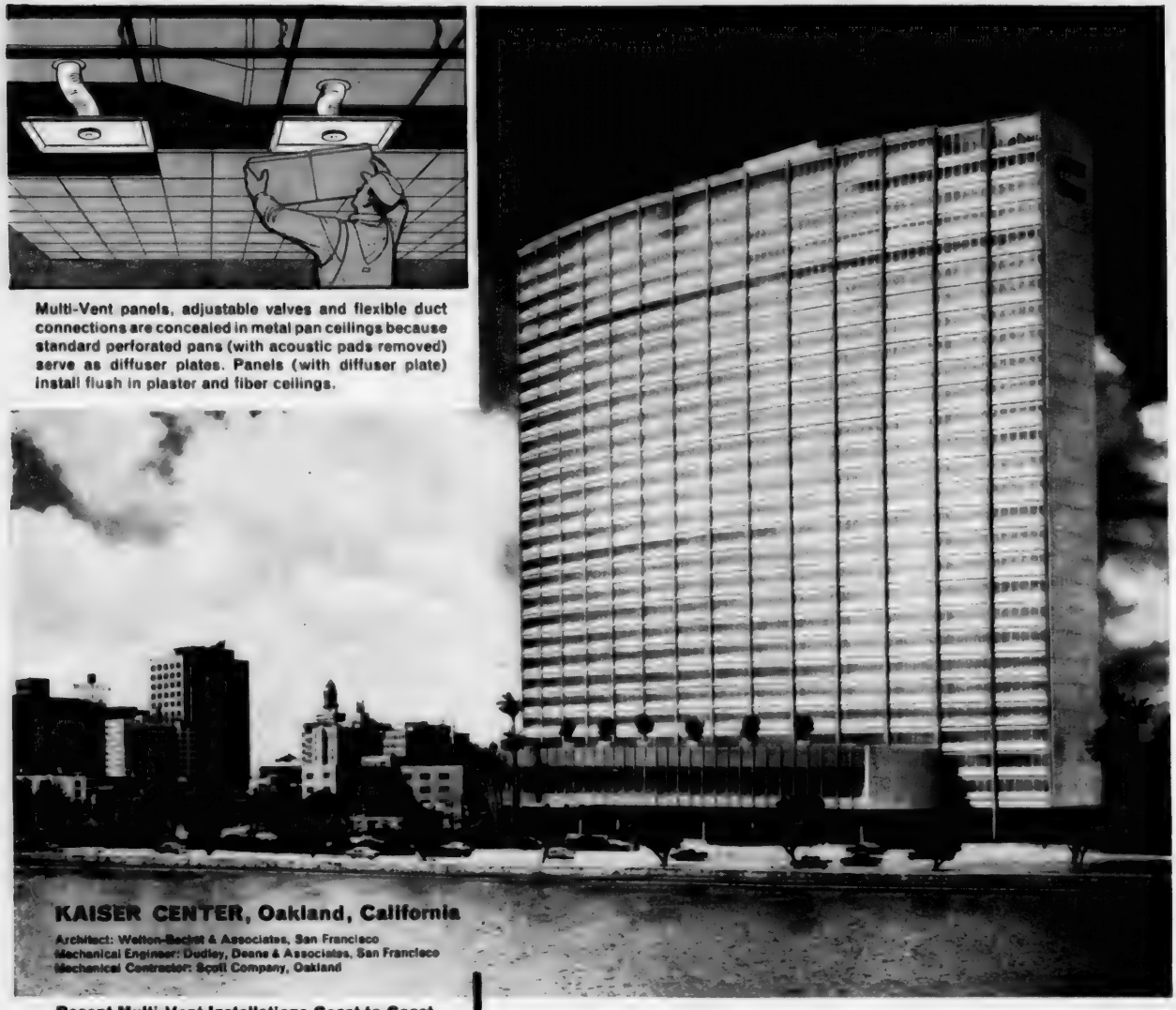

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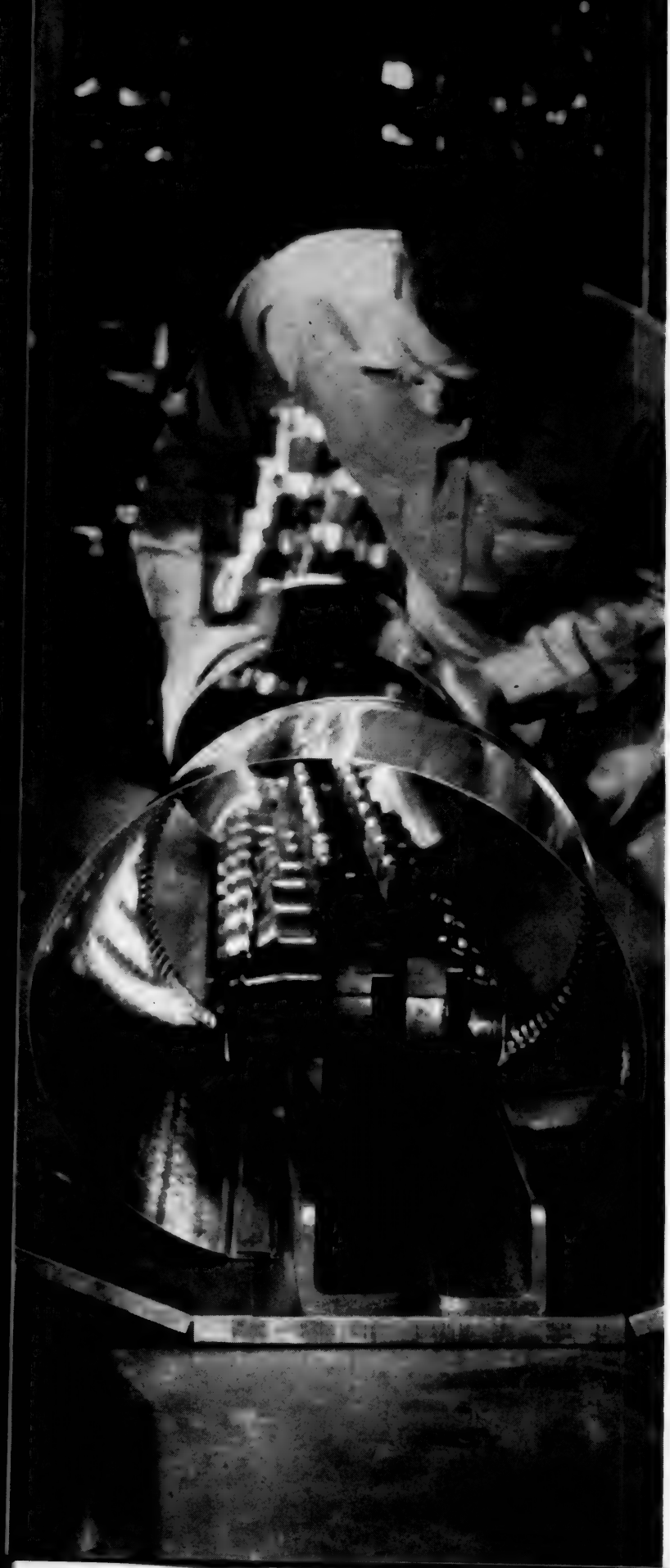

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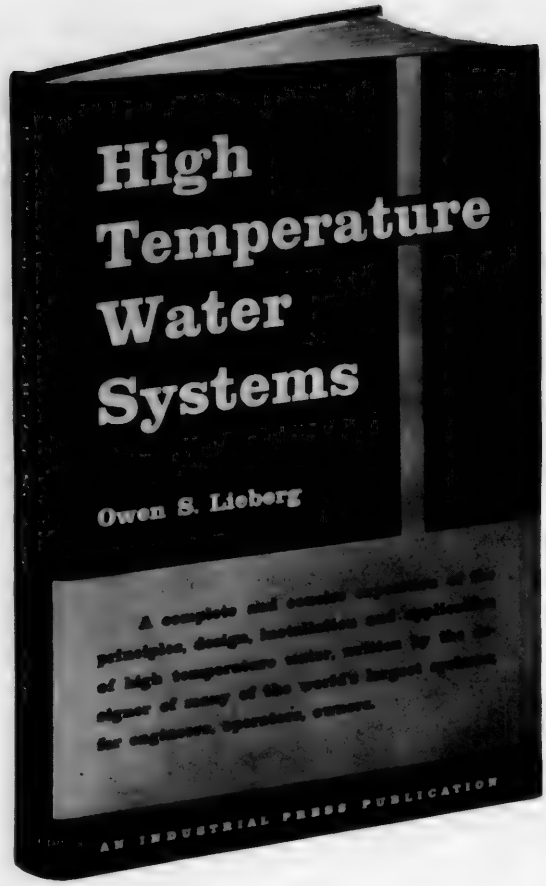

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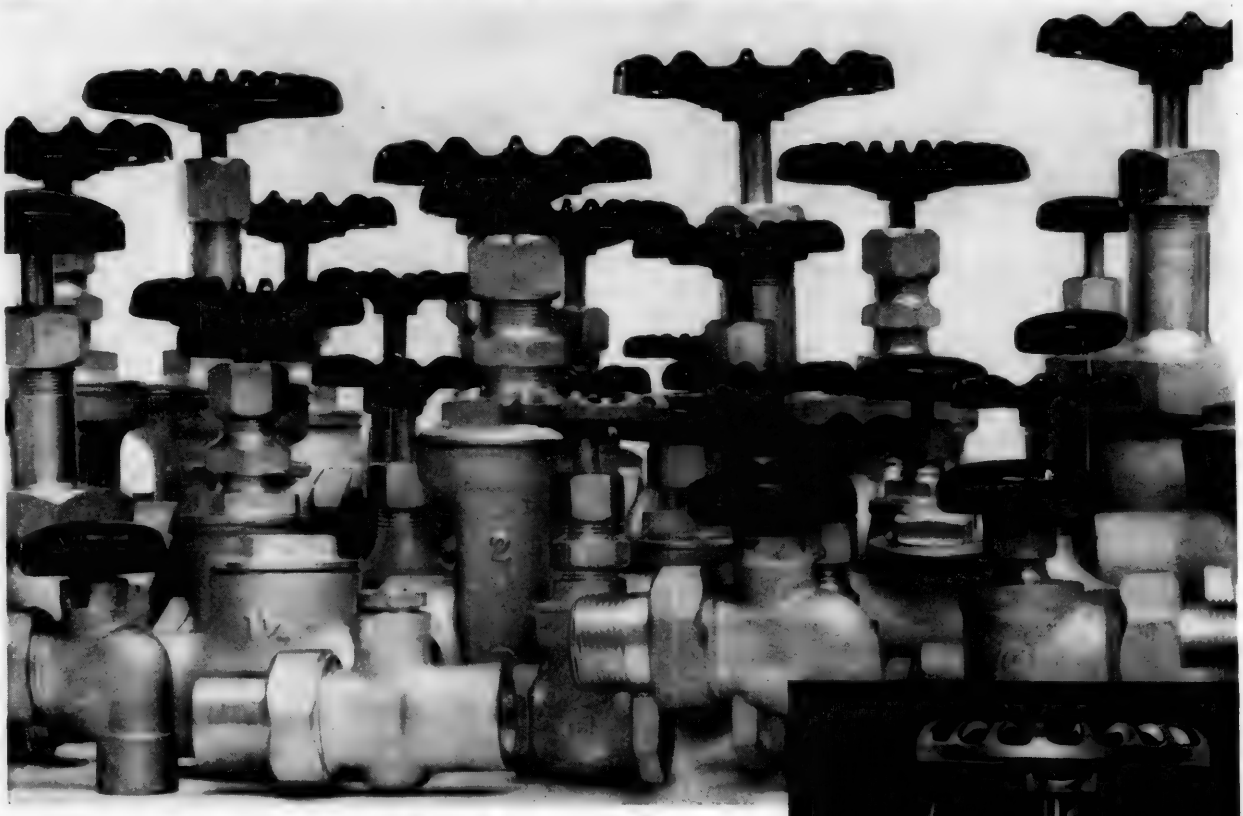

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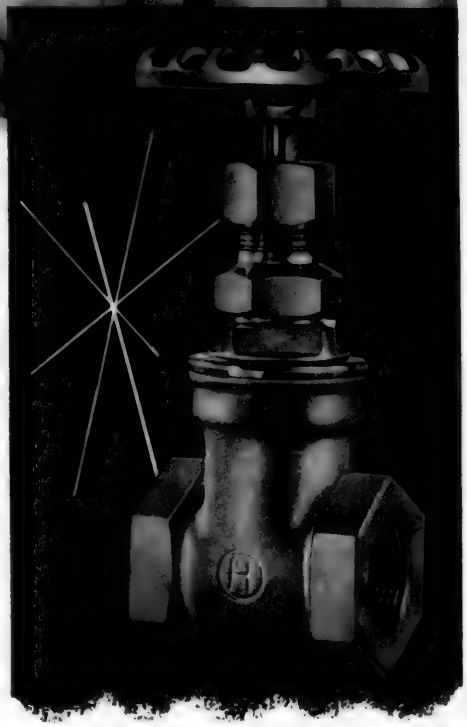

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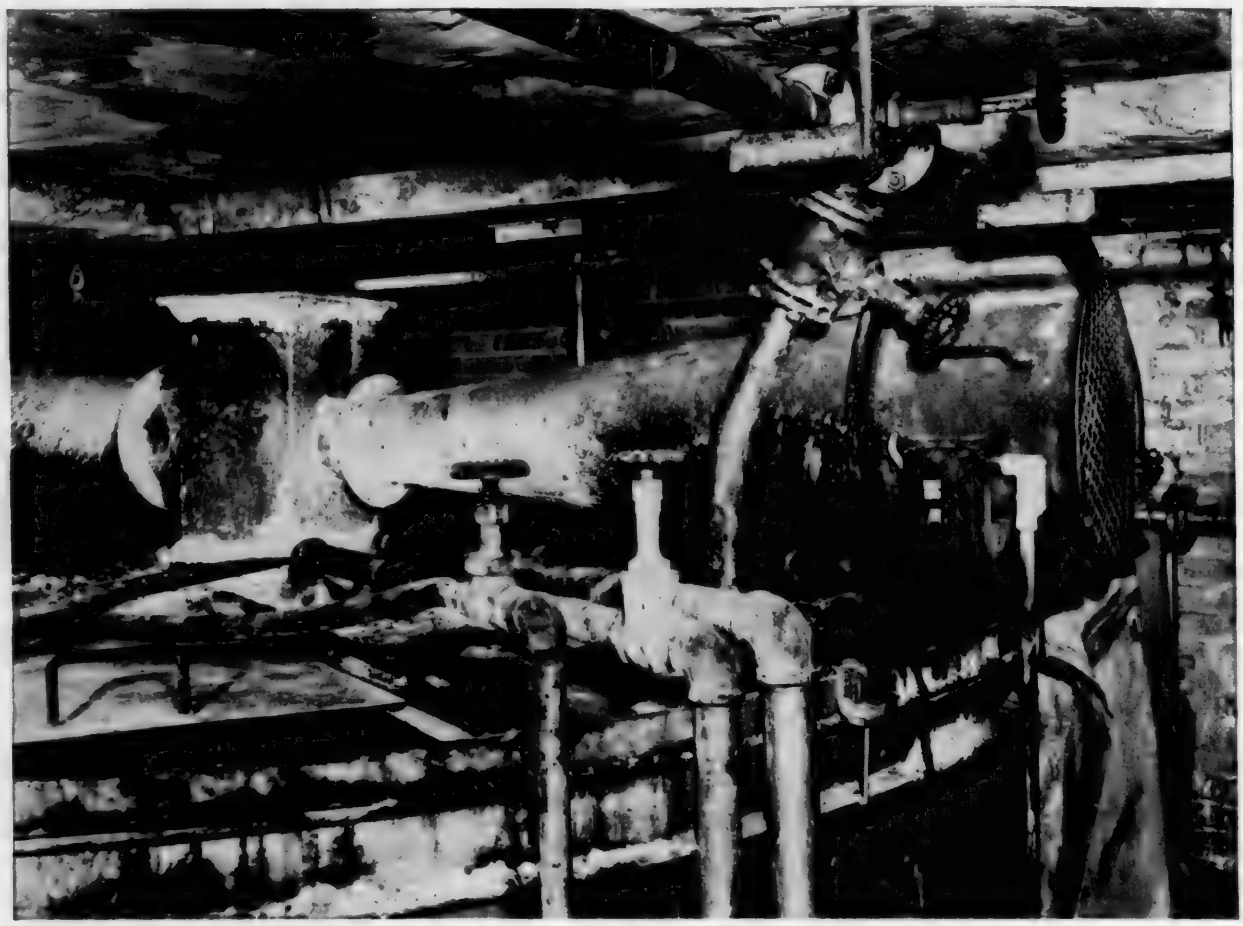

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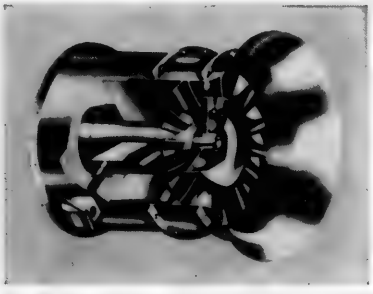

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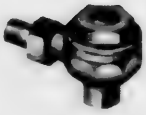
ANGLE PATTERN

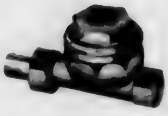
GLOBE PATTERN

CORNER PATTERN (Sectional Below)

MARSH THERMOSTATIC RADIATOR TRAPS



ANGLE PATTERN

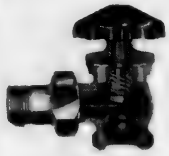


STRAIGHTWAY PATTERN

VERTICAL PATTERN

LEFT HAND CORNER PATTERN

RIGHT HAND CORNER PATTERN



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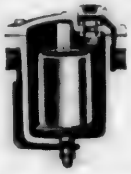

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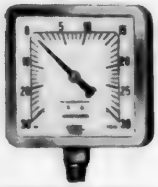

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Underground Heat Distribution Systems

How To Protect A System Against Failure

Specifications are the *only* way a designing mechanical engineer can be assured the final project will have met his required standards and be of the quality the owner bought.

Three major elements make up an underground heat distribution system: an inner pipe to convey steam, high temperature hot water, chilled water, condensate, etc., (type and size depending upon project requirements); the insulating of the inner pipe to minimize heat loss; and the outer casing to protect the insulation and inner pipe.

The outer casing has to be specified in such a way that it will provide positive protection against moisture entrance and accumulation. Saturated insulation, of course, equals low efficiency. Moisture, present constantly in buried pipe, accelerates corrosive action which is amplified in acidic and electrolytic soils.

Testing welded joints by applying a soap solution with the casing under 25 p.s.i.g.

To be positively leak tight tne casing must be tested air tight. The engineer should specify a 25 p.s.i.g. air test on the casting for two consecutive hours without a drop in pressure.

In order to prevent accumulation of moisture, the casing should be specified with a smooth interior.

Impact from above and earth back fill weight is a problem the engineer resolves by specifying a 14 gauge steel casing with a spiral lockseam for added crush resistance.

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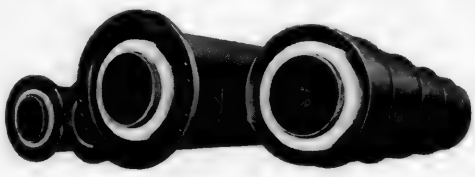

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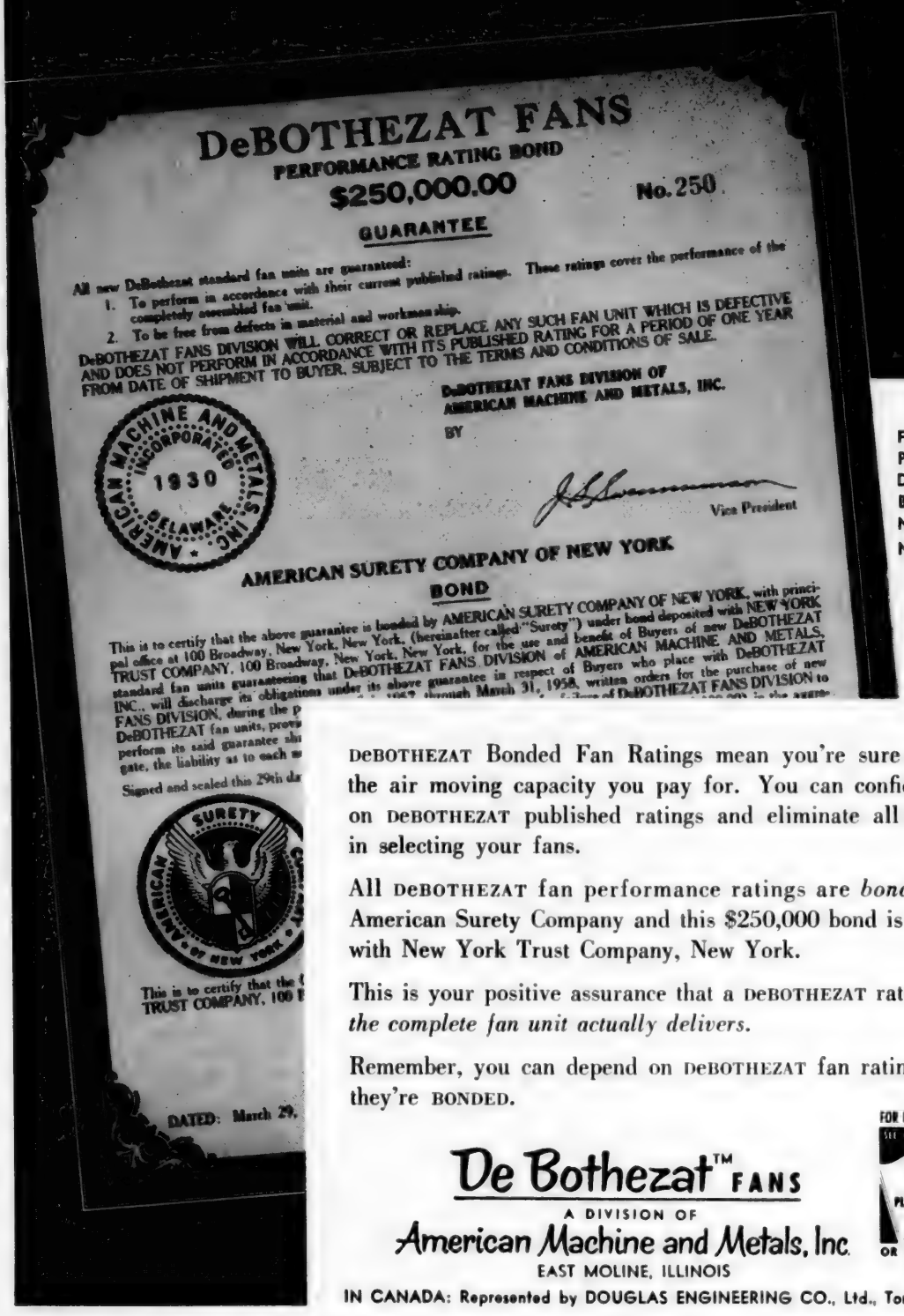

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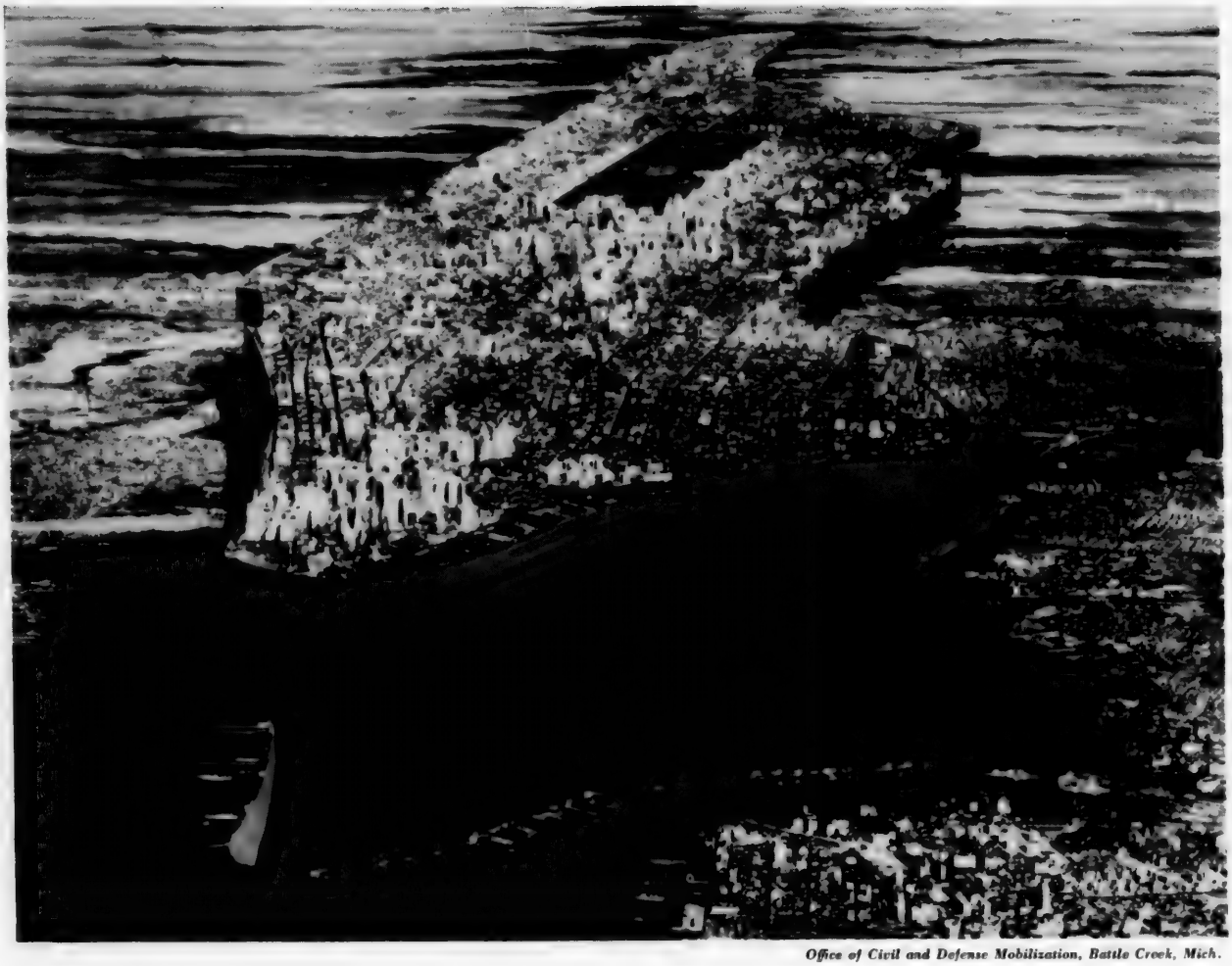


Office of Civil and Defense Mobilization, Battle Creek, Mich.

While military designers are generally looking upward to the paths of missiles and supersonic aircraft, the direction of survival seems to be downward. Much attention is being given to underground shelters, ranging in size and scope from family-size shelters to larger installations capable of housing manufacturing facilities, operational headquarters, or large portions of the civilian populace.

Regardless of the size of a contemplated underground shelter, certain basic factors have to be considered in the selection of such services as water supply, air supply, and environmental control. Detailed study of this subject by the Special Projects Staff of Guy B. Panero Engineers was summarized in a report prepared at the request of The Rand Corporation, of Santa Monica, Calif. Some of the high points of that report are presented on the following pages.

The photo above exposes a few of the 25 underground shelter groups and communicating roadways proposed for Manhattan Island. This separate survival study, prepared by the Panero office, would provide shelter for the Island's 4-million daytime inhabitants for a period of three months under full-scale atomic attack.

For any underground shelter, here are basic considerations in . . . . .

Selection of Services For Underground Shelters

J.W. BARRETT, P. E.
Limited Partner, Guy B. Panero Engineers,
New York, N. Y.

IN the selection of services for occupied underground spaces it is important that the prime purpose of such a space be taken cognizance of in the design. The two basic differences in shelter spaces from an occupancy viewpoint lie in whether part-time occupancy, such as for civil defense, is contemplated, or whether the shelter will be a full-time operational space, such as a command headquarters, a missile base, or perhaps a manufacturing facility.

The basic differences in thinking of utility design for such spaces will be the short duration, high occupancy concentrations of the civil defense type shelter as compared to the others mentioned, and the possibility of deleting all outside ventilation for civil defense shelters, depending entirely on artificial air revitalization. The practicability of this latter design depends to a large extent on the number of people involved and the number of days of isolation required, the cost of the required chemicals introducing a very important factor to be considered, as compared to ventilation shaft and closure costs.

In the operational shelters, some form of ventilation from outside is mandatory, the artificial revitalization of air being provided for button-up operation under post-blast conditions only.

The difference in population density of the different types of shelters imposes different types of loading on the environmental control system. For large population density areas with a minimum of heat-producing machinery, the air conditioning load will possess a low sensible heat factor, requiring lower refrigeration media temperature than would be required for a high percentage sensible heat load as occurs where there is predominance of computers or other heat producing electrical equipment.

Another consideration in differentiating between the types of shelters would be the source of water and power supply. A civil defense type shelter presumably would need only emergency type service originating within the shelter, while an operational type space would require emergency service in addition to connections with outside sources such as the local public utility for normal day-by-day or, at least, stand-by use.

Other than the differences mentioned previously, all underground spaces may be treated similarly, load calculations and basic considerations being applied in the normal manner as modified by information in the succeeding sections.

WATER AND AIR SUPPLY

Utility considerations in underground spaces are complicated by the difficulty of obtaining an economical means of heat disposal for the ever-existing rejected heat from power generation and refrigeration equipment, and from the lack of air available for combustion processes. The normal means of performing these vital functions in surface installations is to make the utmost use of the prevalent surface resources—water and air—to accomplish the desired heat removal and to supply combustion air. The nature of the abundant surface supply of these resources allows each process to determine its own requirement and dispose of its heat and waste products as necessary with very little or no effect on associated processes. An example of this might be the condenser cooling water for a power plant being completely independent of the cooling water requirement for refrigeration for an installation a short distance away to which the power plant is supplying energy.

Compare this to the problem of an underground installation with a limited water supply and where each connection to the outside air involves a large expenditure and provides a potential weak link in an otherwise strongly protected structure. In this latter case, the utmost use must be made from each gallon of water and each cubic foot of air brought into the space. The requirement imposes a necessary interdependence of utility components which is not encountered in conventional surface design. In sub-surface installations no one utility can be considered in design to the exclusion of all others. The conventional approach of having each engineering specialist determine the optimum means of solving his particular problem must now be abandoned in favor of a broad, well integrated program, with complete engineering coordination.

In order to provide a broader understanding of the problems involved, three general basic possibilities will be considered. These are in connection with the availability, under emergency or post-blast conditions, of cooling water or a "heat sink" source in a hypothetical underground installation. In the order discussed subsequently these groups are:

1. An adequate supply of protected water for all potable and cooling uses;
2. A limited supply of protected water, adequate for potable use and make-up requirements only; and
3. No supply of protected water for any use at all.

Adequate Supply of Protected Water

An adequate supply of protected water will occur, in all probability, in a minority of cases but will provide the opportunity for designing an installation completely independent from surface connections for extended periods. This would be accomplished by the use of a nuclear reactor power plant (where total installed power capacity

exceeds 2000 kw), thus eliminating combustion air requirements, all excess heat being removed by means of the available water supply. Waste water and sewage would be pumped to the surface or the water would be pumped into diffusion wells and sewage into retention chambers.

In an installation proposed for a specific large-city deep shelter, designed for 90-day occupancy, the primary water source would supply cooling to the air conditioning coils at a maximum temperature of 60 deg F. The water would increase 10 deg in temperature through the cooling coils and approximately another 10 deg in the refrigeration condensing equipment. The potable water for drinking and cooking would therefore be obtainable at approximately 80 deg under worst design conditions. This would also be the temperature of the water available for the turbine steam condensers. These condensers would operate with an approximate 20-deg temperature spread depending on the actual steam rate of the turbine cycle chosen. Water leaving these condensers at 100 deg would be available for all sewage conveyance, showers, and all other miscellaneous uses before being discharged to the existing surface sewer network.

Under failure conditions of the primary water sources, the potable water would be obtained from water storage vaults which would be connected into the potable water system. Under these conditions the potable water supply and distribution would be completely independent of the general water supply system. The drainage from the potable water would be pumped into the general distribution system feeding the power plant steam condensers. The cooling water supply would be obtained from river sources and rock faults and proceed directly from air conditioning equipment to power plant steam condensers, picking up potable water drainage enroute. From the steam condenser discharge the normal cycle would be resumed, with the possible exception of curtailment of showers until it was determined that the river water supply was not dangerously contaminated.

The air conditioning capacity may be reduced somewhat in this emergency flow cycle, depending on the river water temperature, but shelter conditions would be expected to remain within acceptable limits.

The largest single consumer of water and electric power in a long occupancy civil defense shelter is the air conditioning system, and accordingly any adjustment in water and power requirements of the air conditioning system must necessarily give priority to considering minimizing the total net effect on both of these services. It is of major importance that the air conditioning coils receive the primary water supply at the lowest possible temperature before all other uses.

The selected method of power generation in the preceding case was by a combination of pressurized water reactor and conventional steam turbine-generator. The reactor cycle, if considered, should be of the type which confines any radioactivity produced within a closed loop. Of the types of reactors which are developed to the point of possible use at this time, the pressurized water reactor plant best suits this requirement.

This type of installation, while possessing the highest protection potential when using complete air revitalization, is also least likely to occur in nature, as mentioned previously. *Site location studies should definitely consider the availability of independent underground water supply as a major requirement.* The first cost of a reactor could

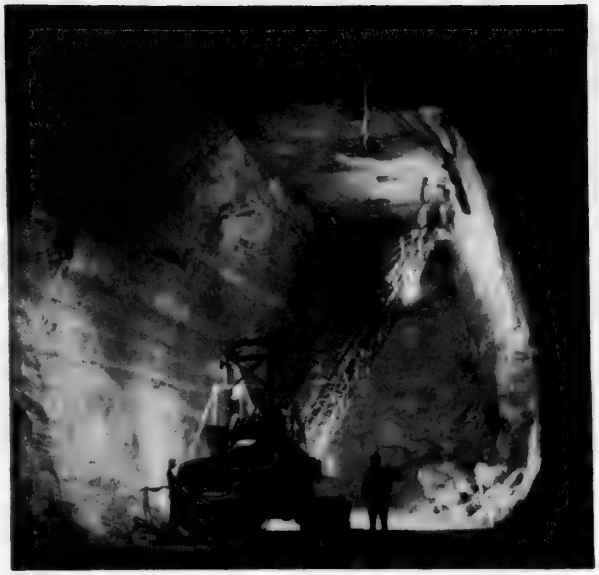


Fig. 1. Conventional mining techniques can be applied to excavation of underground shelters. Photo, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

be justified only by the intensity of the need for complete surface independence, this cost ranging from $1000 per kw for the smallest reactors to possibly $500 per kw for the very large ones (100,000 kw).

Two detrimental reactor characteristics in addition to the high cost should be pointed out:

1. The necessity for complete shut-down for refueling, thus requiring complete stand-by facilities; and
2. A relatively long start-up period with some forms of electric power being required to start.

With an underground supply of water less than 1-2 gpm per kw, the use of a reactor and steam-driven generators is eliminated. The conventional boiler plants and steam-driven generators are eliminated for the same reason. The alternate means of power generation (for units below 3000 kw each) with lower water requirements because of high permissible jacket temperatures, less waste heat, and with almost instantaneous starting, is by means of diesel-driven generators. This is a more economical installation, in terms of first cost, than steam-driven generators using either a reactor or a conventional steam plant. The diesel-powered generators cost in the order of $160 per kw. However, the cost of providing air shafts for combustion air and exhaust adds to the initial cost. With a hypothetical 100-ft depth, the required shaft costs in sand add $40 to the unit cost of the diesel, for a total of approximately $200 per kw for a diesel installation in the 1000-3000 kw range. The cooling water rate for a water-cooled diesel with a heat exchanger is about 1/6 gpm per kw. This reduction in the water requirement helps make practicable the development of wells or other water sources within the space itself.

In both of the previous cycles it has been assumed that the supply of water is as "hard"—that is, protected—as the space it serves, and that it is adequate for the isolation or button-up period with no storage required. It is understood, of course, that the diesel may be used in either of the circumstances within range of the commercial capacities.

Limited or No Supply of Protected Water

As soon as the protected water supply becomes limited below the quantity required for a once-through cooling cycle, some form of storage-type heat sink for button-up operation must be utilized. The capacity of this heat sink will depend on the quantity of protected water available, and the problem of a limited or non-existent protected source of water resolves into one of the extent of heat sink capability necessary.

With an adequate supply of cooling water available from unprotected sources for normal, non-emergency use, it may be possible to use a once-through cooling cycle but in most cases it is to be expected that some form of water conservation device will be necessary. These may consist of surface-mounted cooling towers, spray ponds, or cooling ponds, in that order of preference. The first listed is the most compact and positive acting, being of the mechanical draft type. The other two are influenced by the vagaries of the winds. The cooling pond, however, may be considered to possess some inherent "hardness" capability, being slightly below the surface of the ground.

The required connections from the underground space are not inherently protected and these provide a weak link unless otherwise designed. The cooling tower may be given a degree of protection by recessing it into the ground, but this provides a relatively minor increase in blast resistance unless the tower is designed for specific overpressure criteria.

For button-up operation the heat disposal problem becomes magnified considerably and some form of a heat sink must be adopted which absorbs the heat from the diesels or steam condensers of the power generating facility and from the refrigeration condensers of the air conditioning cycle. Some of the typical unit heat rejection quantities are summarized below:

Refrigeration	15,000 Btu per (hr) (ton)
Diesel exhaust	3,000 Btu per (hr) (kw output)
Diesel jacket	3,200 Btu per (hr) (kw output)
Steam condenser	10,000 Btu per (hr) (kw output)

Fig. 2. Elaborate facilities provided in a limestone mine can be duplicated, if not improved, in underground installations specifically designed for occupancy. Photo, Guy B. Panero Engineers, New York, N. Y.

While these figures are approximations and should be used only as such, it can readily be seen that the heat sink capability requirements with no water available can assume tremendous proportions. Following is a summary of the types of heat sinks which have been considered.

1. *Outside Air.* In order to utilize the air as a heat sink, below-ground cooling towers, evaporative condensers and/or fan-cooled diesel jackets, with the same degree of protection or hardness capability as the space itself, will be required. Unit air quantities required are:

Evaporative condensers (for refrigeration only	.013-.02 cfm per (Btu) (hr) heat rejected
Cooling towers up to 50 tons	.02-.027 cfm per (Btu) (hr) heat rejected
Fan-cooled diesel radiator	70-80 cfm per kw

For large installations the shaft and closure requirements, considering required duplication and dispersion, are extremely costly. In addition to air shaft requirements for cooling, additional shafts, as mentioned previously, will be required for combustion air (4 cfm per kw) and combustion exhaust (8 cfm per kw). Unit costs will vary considerably with size of shafts and since the outside air would provide cooling during normal and button-up operations, a simple unit cost figure per million Btu (as will be given for the other types of heat sinks) will not provide a proper comparison.

2. *Underground Heat Reservoirs.* These are more reliable than those using the outside air inasmuch as there are no surface connections necessary. Prime considerations are cost of excavation (which varies with geology and depth), interior finish (if any), cost of substance actually storing the heat, and mechanical adaptations necessary to utilize the heat storage capacity. Three methods of storing heat which have been considered are:

(a) Sodium sulfate ($Na_2SO_4 \cdot 10\ H_2O$). Research work has been progressing at Massachusetts Institute of Technology with this substance, primarily regarding its use for storing solar energy. The heat absorbing characteristics are good for the purpose of storing underground heat inasmuch as the melting point of this material is 87.8 deg F, and the heat of fusion 92.4 Btu per lb. Density is 91.0 lb per cu ft, and it has a fusion heat capacity of 8400 Btu per cu ft. The chemical will occupy 106.5 cu ft per million Btu of heat absorbing capacity when being heated from 60 to 100 deg, ignoring the effect of heat transfer to surrounding rock or earth. Based on a cost of the chemical at $12 per ton, the cost of heat storage capacity may be expressed as $58.2 per million Btu. Note that this is representative of chemical cost only and does not include cost of excavation or of mechanical adaptation for utilizing the peculiar properties of this material. In order to obtain a more rational comparison with other less costly materials, the cost of excavation should be included. In self-supporting rock a figure of $15 per cubic yard may be assumed. This resolves the above unit cost, now including excavation, to $118 per million Btu.

(b) Water. Using a density of 62.4 lb per cu ft and a specific heat of 1.0 Btu per (lb) (deg), we find that water will require 400 cu ft per million Btu with an increase in temperature from 60 to 100 deg. Ignoring the first cost of the water, the cost of the space occupied will be $228 per million Btu, on the same basis as *(a)*.

(c) Ice. The application of an ice reservoir is similar to that of the sodium sulfate reservoir in that the heat of fusion is the principal means of absorbing the rejected heat from the cycle. The criteria in the ice evaluation are as follows: Density, 57.5 lb per cu ft; heat of fusion, 143.2 Btu per lb; melting temperature, 32 deg F; and specific heat of water, 1.0 Btu per (lb) (deg). A volume of ice sufficient to absorb the heat accompanying an increase in its temperature from 32 to 100 deg will occupy 81.6 cu ft per million Btu. At a unit price of $15 per ton, ice will cost $35 per million Btu. When the excavation cost is included, the unit price becomes $81 per million Btu. In addition to being the most economical selection of the three methods discussed, ice has the advantage of not requiring the operation of refrigeration equipment for some time after the button-up operation has begun.

It should be noted again that the unit prices mentioned previously apply to spaces which must be excavated. If sufficient mine space is already available, the most economical system will be that using the least costly heat absorbing medium—water.

Absorption of Heat by Rock

Extensive research work has been performed by the U. S. Bureau of Standards on the subject of heat absorption by rock around underground spaces. It should be noted that in the preceding discussions this effect has been largely ignored, but if specific information on the proposed site can be obtained, calculations based on the Bureau of Standards' findings can be made and definite reductions in the size of the required reservoir or other heat sink devices will result.

Well Water

After reviewing the preceding information it becomes apparent that the most economical means of providing a button-up capability would be an underground source of water which would place the shelter space in Group 1 on page 62. This is an extremely important point and in some installations the availability of water from an underground protected source may reduce the cost of the entire mechanical installation by as much as 50%. The significance of this lies in the fact that siting studies possibly should take into account the need for water rather than attempt to avoid locating in an area where water is indicated. Other factors influencing construction and ground shock transmission will have to be taken into account in the overall evaluation.

ENVIRONMENTAL CONTROL

The entire success of the underground installation is dependent on the ability of the air conditioning or ventilating system to sustain the atmosphere inside the space within the required limits of temperature, humidity, carbon dioxide, oxygen, and noxious gas concentrations.

The basic problem can be resolved into two separate considerations: Peacetime, or non-attack conditions, when outside air for ventilation may be admitted; and wartime, under attack conditions, when button-up procedures must be observed. Since for most conditions the optimum means of power generation is by means of diesel generators, as discussed previously, the need for combustion air and exhaust capability will be continuously present. Comfort conditions must be provided in both peacetime and wartime in order to provide suitable working environment for an operational space. In addition to personnel considerations, the provision of suitable conditions for operational equipment is also necessary.

Physiological Considerations

Man normally maintains his body at constant temperature by internal regulatory centers. These centers exert their control in heat balance through the automatic nervous system with regulated dissipation of heat from the metabolic processes. There is a relatively constant loss of heat through the lungs and a fairly fixed amount of heat loss in the excreta, but the skin is the primary factor in the regulation of body heat.

Some heat transfer to the outside occurs by radiation; a little by conduction to garments and to cooler surfaces with which the body might come into contact; a larger amount by evaporation of perspiration; but mostly heat is transferred by the process of convection, as steady movement of air over the skin replaces the warm layers next to the skin with cooler air.

The most widely accepted index of thermal comfort is Effective Temperature as developed by the American Society of Heating and Air-Conditioning Engineers. This index uses three variables in establishing Effective Temperatures: dry bulb temperature, relative humidity, and air movement. It does not take mean radiant temperature into consideration, but this factor is not of importance if the walls and air are at the same temperature. This, of course, is not the case in most underground spaces as the walls will usually be at a lower temperature than the air within the space. When the design of the underground complex proceeds to the more advanced state, the additional factor of mean radiant temperature may be taken into consideration based on results of continuing research on the subject of underground habitation.

The optimum Effective Temperature is 71 which corresponds to a dry bulb temperature of 76 deg, a relative humidity of 50%, and air movement of approximately 20 feet per minute. A normal person can rest and sleep well at 78 ET, and can do light work up to 80 ET if adequate periods of rest are possible. Sweating occurs with Effective Temperature of 78, and a rise in body temperature begins with Effective Temperature of 85. Above 80 ET there is an appearance of heat rashes and sleeplessness; above 85 ET it is impossible to work effectively; and above 90 ET individuals are susceptible to heat stroke.

In view of the foregoing it is obvious that all occupied spaces must be air conditioned with an absolute maximum Effective Temperature of 80 being maintained.

Air Revitalization

The key to the problem of complete isolation from the surface lies in the capacity to revitalize the air in the occupied spaces which have been cut off from fresh air supply after an attack. It is necessary to provide sufficient chemical quantities to ensure survival for the entire button-up period completely cut off from the surface. This is felt to be necessary to guarantee complete security in the event of multiple attack, the closure-sensing element possibly having been destroyed in the first blast. If the blast closure were opened too soon, after the closure-sensing element had been destroyed, a second blast could destroy the entire installation.

In the case of combustion air and exhaust, the closures must be opened moments after the initial closing in order to continue the power generation. A short blackout period could be alleviated by emergency battery-operated lights at strategic points. These would be automatically kept charged during normal operation. The diesel engine could be designed to withstand some over-pressure and possibly could be made secure from re-attack even in the case of failure of the sensing element. This, however, is not the case for the cooling air shafts required for fan-cooled equipment and should re-attack occur, the equipment in the engine rooms could conceivably be destroyed or rendered inoperative.

Air revitalization can be divided into three general categories: CO_2 removal; O_2 addition; and odor and contaminant removal.

Carbon Dioxide Removal

In order to keep the persons in the space alive and relatively comfortable, the CO_2 level must be kept below the maximum concentration found to be safe. Normal air is a mixture of gases in the percentages below, with traces of hydrogen and some other rare gases:

Nitrogen	79.02%
Oxygen	20.84%
Carbon dioxide	.14%

Expired air under normal conditions consists of the following percentages:

Nitrogen	79.7%
Oxygen	16.3%
Carbon dioxide	4.0%

One percent or less of CO_2 is harmless, and after air purification has started efforts should be made to keep the percentage of CO_2 from going above this amount. Two percent of CO_2 would ordinarily not be noticed but may cause some discomfort if work requiring strenuous exertion was attempted. Prolonged breathing of over 3 percent CO_2 causes discomfort in breathing even at rest and becomes progressively dangerous above 4 percent. The amount of CO_2 should never be allowed to exceed 2 per cent. For normal activity this will require the absorption of approximately 0.85 cubic feet of CO_2 per person per hour.

There are numerous methods for absorbing CO_2 from the atmosphere, all of them involving chemical action. Some of the methods considered are shown as follows:

Chemical	Amount in lb required per man-hour	Bulk cost per lb*	Remarks
Lithium hydroxide	.124	2.00	
Soda-lime	.34	.30	
Barium oxide	.474	.13	
Potassium tetraoxide	.364	1.60	Produces O_2
Sodium peroxide	.288	1.30	Produces O_2

* Bulk prices do not include allowance for packing for use.

In addition to the above there are various types of packaged regenerative CO_2 equipment available.

The first three listed chemicals are CO_2 absorbers exclusively. The latter two (potassium tetraoxide and sodium peroxide) are combination CO_2 absorbers and O_2 generators. *Coincidentally, the proportions of CO_2 absorption and O_2 generation in the reactions of these two chemicals are in excellent metabolic balance to sustain human respiratory process.* The regenerative equipment separates the CO_2 from the air, from which point it must be collected in containers or disposed of by other means. The regeneration cycle requires power to operate in the order of 15 kw per 200 persons in the space.

In general, where the total cost does not become prohibitive, potassium tetraoxide or sodium peroxide offers the best solution for the problem. The latter is less costly but is more difficult to handle because of the inherent violence of a sodium-water reaction. Both will react violently when saturated with water but both require minimum relative humidities of 15 to 20% in the atmosphere to function properly.

Oxygen Addition

As an adjunct to the absorption of CO_2 the oxygen removed from the atmosphere must be replaced at the rate of approximately one cubic foot per person per hour. As indicated previously, the use of potassium tetraoxide or sodium peroxide could provide sufficient oxygen to meet all normal requirements. Small amounts of emergency bottled oxygen must be stored in any event for medicinal use.

If, as may be a possibility, the use of a combination chemical CO_2 absorber and O_2 generator proves impractical, positive separate oxygen supply or generating equipment and CO_2 absorption equipment would be required. Some possibilities for providing oxygen follow.

Storage of Compressed Oxygen Gas

Compressed oxygen is normally stored in standard 2500-psi cylinders, which may hold up to 1450 cu ft of oxygen at standard conditions, at a cost of approximately 50 cents per 100 standard cu ft. Separate CO_2 absorption facilities would also be required at additional cost and further volume requirements. The storage space required for the oxygen bottles may become excessive for a long period, heavy occupancy situation, and this should be checked.

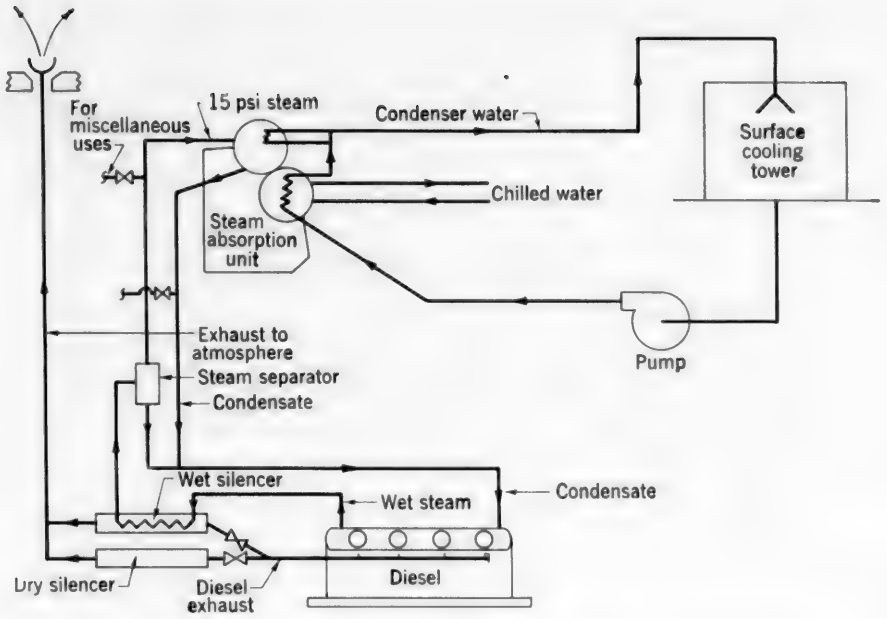
Hydrolysis

This method is applicable where water supply is adequate and the large power demand is not prohibitive. The present power requirements for hydrolysis operation is approximately 250 kw per 100 cu ft of oxygen. The cost of equipment and the additional power cost of compressing and disposing of the reaction by-product (hydrogen) must also be considered. Any possibility of using this gas for combustion must be disregarded since this process would always use the quantity of oxygen liberated in the hydrolysis, and so be impractical. The gas must be compressed and stored, or otherwise disposed of. The quantity of water required and the tremendous power costs in addition to the equipment costs will likely prohibit this method of oxygen generation.

Storage of Liquid Oxygen

Liquid oxygen is stored at atmospheric pressure at a temperature close to minus 300 deg F. The containers naturally require very extensive thermal insulation and, even so, must be bled continually to the extent of $\frac{1}{8}$ of 1% per day to prevent pressure build-up. This represents

Fig. 3. Diesel jacket heat plus exhaust heat produces steam for air heating or absorption refrigeration in this variation of the ebullition cooling cycle.



a continual replacement cost whether the shelter is in use or not, and the magnitude of the operation may make this cost exorbitant. The additional disadvantages of large storage areas needed and special materials required normally remove this method of providing oxygen from serious consideration.

Chlorate Candles

These candles give off oxygen as they burn to the extent of 80 cu ft per candle, each candle being suitable, therefore, for 80 man-hours during a burning period of 45 to 58 minutes. The cost per candle in lots of 200 is $30, but this price presumably could be reduced for bulk purchases.

Outside Air

It is possible under certain conditions to obtain the required oxygen from the outside air through the normal air intake and exhaust shafts where these are provided. However, the uncertainty of closure operation in case of re-attack, as mentioned previously, and the possibility of radioactive contamination, make it advisable to eliminate use of outside shafts during the so-called button-up period. Where shafts are used in this period, only enough air should be brought in to maintain minimum safe O_2 and CO_2 levels.

Odor Removal and Filtration

Each fan system with outside air connections, except possibly that serving the engine rooms, should be provided with filtration sections consisting of pre-filters, absolute filters as a means of radiation protection, and activated charcoal or similar media for odor removal. Absolute filters are available which remove particles as small as 0.16 micron with an efficiency of 99.5%. These may or may not be desired in the engine rooms, depending on the cooling cycle chosen. If absolute filters are not used in the engine rooms, these rooms should be completely sealed off or isolated from the remainder of the space, and personnel entering this room would have to be properly protected. Areas using complete recirculation at all times will not require absolute filters.

Odor removal can also be accomplished efficiently by potassium tetraoxide or sodium peroxide beds without the use of other media.

Heating

Heating of the outdoor air may be accomplished by a hot water recirculating type system, using part of the exhaust heat of each diesel as the heat source. In order to accomplish this heat recovery, wet silencers (mufflers designed to transfer the exhaust heat to the circulating water) should be provided for each diesel engine in parallel to a second, non-heat-exchanger type silencer. The temperature of the water would be automatically controlled by means of butterfly valves ahead of the two parallel silencers, thus regulating the amount of exhaust gas passing through each. If ebullition cooling of the diesels (through generation of steam in the diesel jacket) is adopted, additional rejected heat would be obtained from the jacket, this heat being available for absorption refrigeration or air heating. If the wet silencer is placed in series with the steam pipe leaving the diesel jacket in the ebullition cycle, as shown in Fig. 3, a total of 2 lb of 15-psi steam per diesel horsepower-hour may be realized. When the normal water-cooled heat exchanger is used for diesel jacket cooling, the cooling water may be used directly for space heating before proceeding to the cooling tower or other similar device.

Bibliography

1. Submarine Medicine Practice — Bureau of Medicine & Surgery
2. Report to Air Force Ballistics Missiles Div. on Air Conditioning and Closure Problems (Secret) — Guy B. Panero Engineers
3. Interim Report on Combat Operational Center for North American Defense Command — Guy B. Panero Engineers
4. Heat Absorption of Rock Around Underground Spaces — Department of the Army, Office of the Chief of Engineers
5. Manhattan Shelter Study for Office of Civil and Defense Mobilization — Guy B. Panero Engineers

Don't Underestimate Advantages of

Air-Cooled Air Conditioning

MURRAY KABILI
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The alert engineer will find many opportunities to offer an air-cooled system, long considered a second-rate substitute, that will do the job as well as, and often at less cost than, a water-cooled system. Presented are certain advantages, along with installations which emphasize these advantages, of air-cooled air conditioning equipment.

THE air-cooled air conditioner is gaining acceptance for commercial applications where it would not have been considered several years ago. Primary reason for this is, of course, water and corrosion problems in many areas. These problems have forced reluctant consideration of air-cooled equipment despite objections that it is more expensive to operate than water-cooled, clumsier to install, less adaptable to varying conditions, and less reliable; that is, prone to failure on the hottest days when most needed.

Reluctance to consider air-cooled equipment except as a second-rate substitute for water-cooled equipment is no longer justifiable, however. With increased experience in air-cooled installations, manufacturers and engineers have done a great deal to overcome initial objections and the inherent advantages of air-cooled air conditioners have become better recognized.

Most engineers in the industry who have no ax to grind concede that water-cooled equipment, installed under ideal conditions, is still the better for most commercial applications. However, where an installation problem boils down to the alternatives of air-cooled equipment or water-cooled with a water re-circulating system, there is more to be said for the air-cooled than there was five years ago. The alert engineer will find many opportunities to offer an air-cooled system that will do the job as well as water-cooled and often at less cost. And there are a growing number of applications where air-cooled is the better choice even when an abundant supply of good water is available. This is particularly true where the engineer can use a number of smaller air-cooled packages for zone control without running long water lines.

Engineers have discovered that air-cooled installation problems are not so troublesome as the industry originally supposed. Elimination of water lines, pumps, cooling towers and their supporting structures simplifies installation and maintenance. In many applications, air-cooled equipment is actually more adaptable than water-cooled. Because there are no water lines to run, air-cooled equipment is more readily located to eliminate noise from the conditioned area and minimize ductwork requirements. There is no pump-down needed for outside installations in preparation for freezing weather as there must be for water-cooled equipment. All service work can be done by refrigeration mechanics, eliminating jurisdictional disputes and unproductive on-the-job labor in servicing.

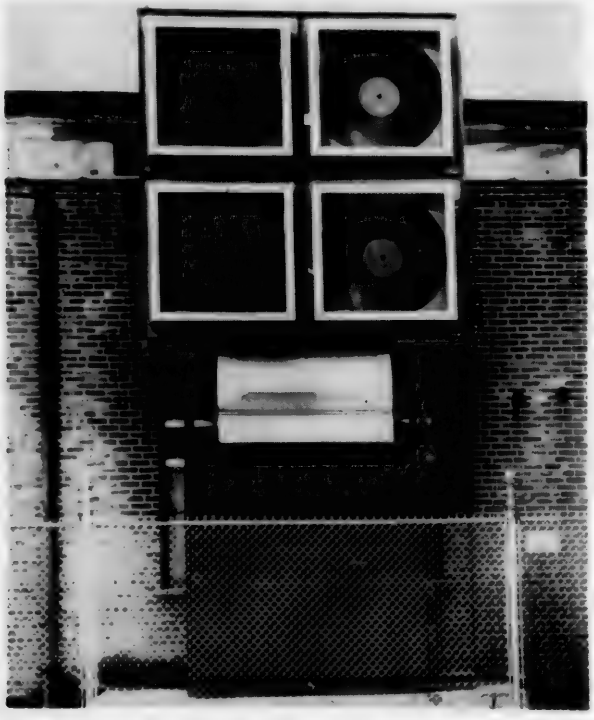


Fig. 1. Four 10-ton air-cooled condensers are grouped above each 40-ton conditioning unit at this industrial plant.

Fig. 2. Each doctor's office in this medical building has its own independent air-cooled air conditioning system.

Fig. 3. One of these roof-mounted air-cooled condensers is 140 ft from the 20-ton air conditioning unit that it serves.

Major design improvements in air-cooled equipment have been use of larger suction cooled semi-hermetic compressors, use of larger motors to improve capacity and reliability, and extension of the range of capacity.

Operating costs are greater with air-cooled condensing than with water because condensing temperature is higher, and the higher the condensing temperature, the less efficiently a unit works. Manufacturers have increased compressor motor size so that increases in power consumption at higher temperatures are tolerable. Today's air-cooled air conditioners operate reasonably close to top efficiency and have enough reserve power to do the job even on the hottest days. For example, in one compressor commonly used for air conditioners with a nominal capacity of ten tons, a jump in condensing temperature from 105 to 120 deg F — a reasonable level when the proper condenser is used — will boost power consumption only 10.5% and decrease capacity only 11%. These losses are generally considered a price worth paying for certain advantages of air-cooled equipment.

Manufacturers have also increased the size of air-cooled equipment to broaden the range of applications where it can be used. The largest unit on the market has increased successively in the last five years from 5 to 7½, 10, 15, and now to 20 tons.

As for the supposed clumsiness and lack of adaptability of air-cooled equipment, a look at some installations will show how these objections have been overcome.

State Capitol

At first glance air-cooled air conditioning was considered undesirable for Indiana's state capitol because outside condensers would detract from the appearance of Indianapolis' number one building. However, use of several 8-ton air-cooled condensers provided economical cooling without injuring the exterior appearance of the building. Installed on wide window ledges, they do not extend beyond the building's lines. The installation chosen was considerably less expensive than any acceptable alternative.

Industrial Plant

Several forty-ton air conditioners, used to cool an industrial plant, were air cooled by the use of four 10-ton condensers for each air conditioner. Conditioners are mounted on slabs along outside walls with discharge through windows. The air-cooled condensers are grouped, as shown in Fig. 1, directly above the air conditioners. No ductwork is necessary.

Medical Building

An installation in a Birmingham, Ala., doctors' and dentists' office building illustrates the flexibility of air-cooled equipment. Each doctor has his own air conditioning system. Compressors and condensers are mounted on the roof, and air handling units are hung in closets in each suite. This installation provides a small package for each doctor, exceptionally economical because each unit operates only when the particular office it serves is in use. See Fig. 2.

Display Room

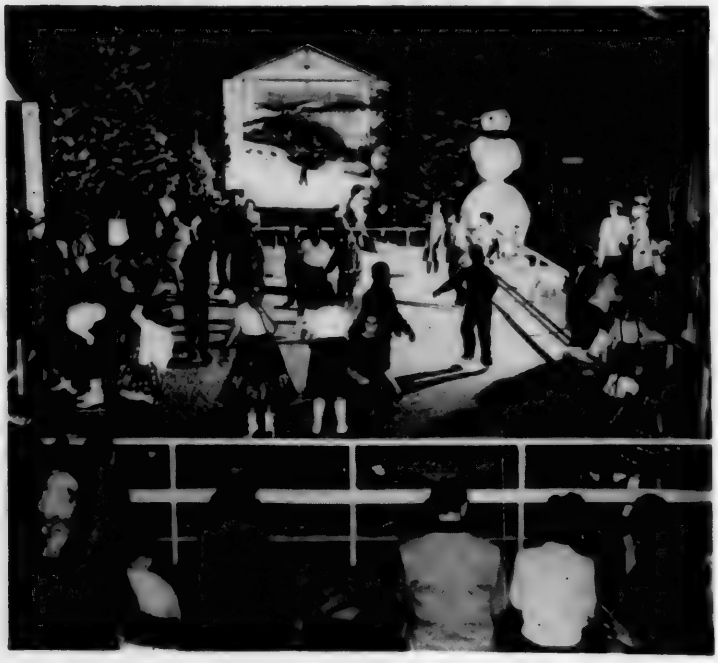
An air conditioner installation in a display room also illustrates the adaptability of air-cooled equipment. This equipment was chosen because display rooms are in a wing several hundred feet from the water supply in the central core of the building. The 10-ton air conditioner is mounted on the floor, and both intake and discharge are ducted through the same window. This simple system worked efficiently except that there was no place to put the condensate. Tenants tried everything from bucket brigades to the use of electric heat to boil off the condensate, which was as much as 30 lb per hr of water. The best and final solution was to route the condensate over the condenser coils where it evaporates.

Manufacturing Plant

Even where air conditioners are installed in areas far removed from access to outside air, it is possible to use air-cooled equipment. In this author's manufacturing plant, a 20-ton air conditioner is air cooled with a roof-mounted air condenser 140 feet away. This long run of refrigerant piping, part of which is shown in Fig. 3, has worked efficiently without a pump-down system and with virtually no hammer effect.

▲ STEAM CALLIOPE. One of the world's few surviving steam calliopes has been donated to the Circus World Museum, at Baraboo, Wis., by Cleaver-Brooks Co., Milwaukee, Wis. Acquired by the company in 1952 from Cole Bros. Circus, the calliope, the authentic "America" of Barnum & Bailey and Ringling Bros. fame, has been used by the firm in an unusual and successful promotional campaign. The circus wagon, constructed for Barnum & Bailey in 1903, has twelve panels of carved figures, each representing a different country of the Americas. In 1940, when owned by Cole Bros., it was rebuilt to carry a boiler and a 32-whistle calliope. When purchased in 1952 by Cleaver-Brooks, the calliope was re-equipped with a 15-hp packaged boiler and a 5-kw generator for automatic operation. A fuel oil tank and water tank were installed below the floor level; drains from whistles were connected into the water tank since blowdown was carried out frequently to keep steam lines free. According to Fred W. Hainer, executive vice-president, shown inspecting the boiler at right, the calliope was operated between 30 and 60 lb pressure, with the higher pressures assuring superior performance.

Picture Paragraphs



◄ PORTABLE RINK. A portable ice skating rink was installed in the auditorium on the fifth floor of Gimbel Bros., in Philadelphia, as a special attraction for the holiday season. Specifications said no piece of equipment was to be longer than 8 ft, this to facilitate handling in elevators. A vapor barrier was laid inside a wood frame; waterproof canvas was then spread inside frame to form the tank for the rink. Over half-a-mile of 1-inch pipe was then installed, and covered to the top with about 5 tons of sand. To build up the ice surface, the rink was not flooded; instead the sand was cooled by brine (cooled by a Frick 10-hp refrigerating unit), and water was sprayed over the top and permitted to freeze. Each layer was added until desired thickness was reached. Entire installation is owned and was installed by Sidney Diamond, of Westbury, Long Island, N.Y.

CHIMNEY SIZING FOR FORCED DRAFT

The accompanying nomographic chart has been designed by Profs. William T. Miller and Norman Arnold of Purdue University to furnish a graphical solution of the formula

$$D_r = 2.96HB_o\left(\frac{W_o}{T_o} - \frac{W_c}{T_c}\right) - \frac{0.00126W^2T_cfH}{D^5B_oW_c}$$

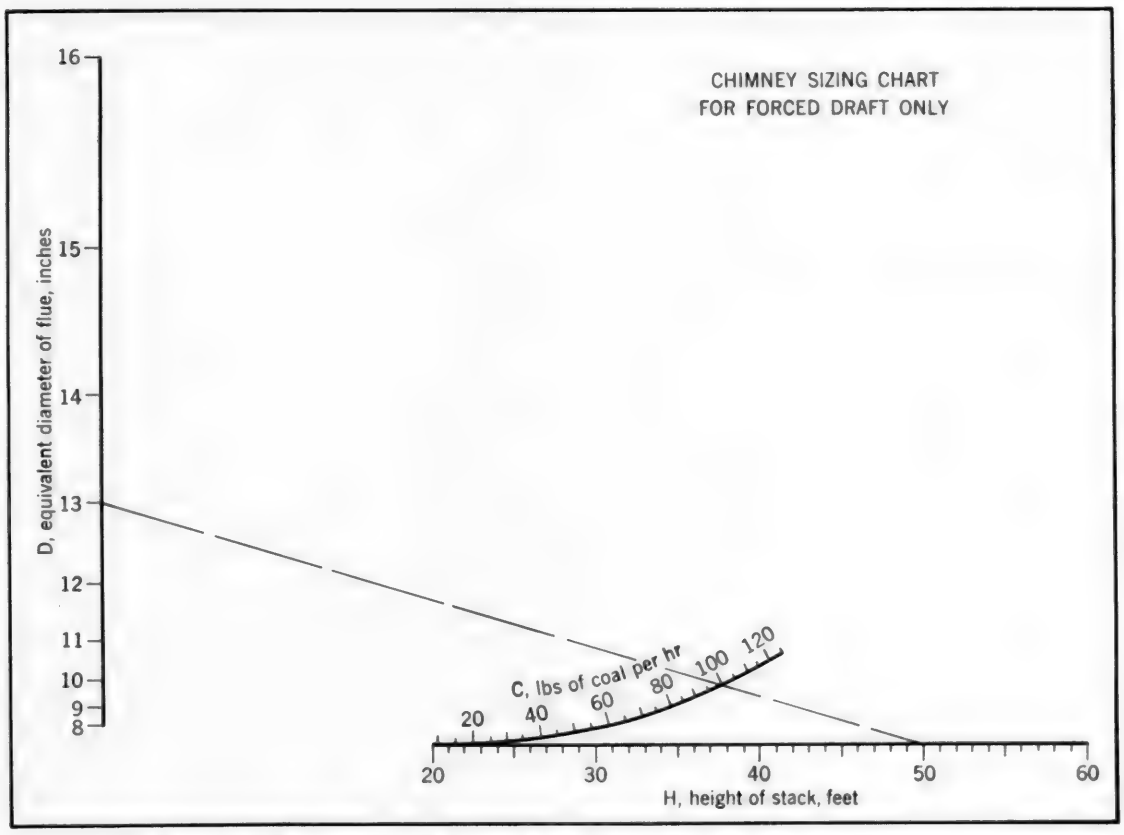
in which

D_r = the total required draft in inches of water,
H = the height of the chimney above the ground in feet,
B_o = the barometric pressure corresponding to the altitude in inches of mercury,
W_o = the unit weight of a cu ft of air at 0 deg F and sea level pressure, in lb per cu ft,
W_c = the unit weight of chimney gases at 0 deg F and sea level pressure, in lb per cu ft,
T_o = the absolute temperature of the outside, air, deg F,
T_c = the absolute temperature of the chimney gases, deg F,
W = the weight of gases generated by the boiler and passing through the chimney, in lb per sec,
f = the coefficient of friction, and
D = the inside diameter of the chimney in feet.

For usual conditions the following values are typical and were assumed:

B_o = 29.92 inches barometric pressure,
W_o = 0.0863 lb per cu ft at 0 deg F, air density,
T_o = 500 deg Rankine, or 40 deg F, outside air temperature,
W_c = 0.090 lb per cu ft, flue gas density,
T_c = 760 deg Rankine, or 300 deg F stack temperature,
f = 0.016, coefficient of stack friction.

In addition, it is assumed that 20 lb of gas per pound of coal is provided.



Note: This chart applies only to forced draft installations and does not make allowances for the draft required to draw air through the fire bed.

After inserting these values in the formula, the equation reduces to

$$D_r = H(0.00487 - 0.0057\,W^2/D^5).$$

It is this formula that has been used to design the accompanying chart. The important assumptions underlying this general equation are:

1. The draft required is not directly proportional to the rate of firing, but a minimum value of 0.05 inches is necessary and the rate increases more slowly than a direct proportion for high rates of firing as given in the I-B-R Rating Code;

2. The static draft of the stack is proportional to the difference in weight of the column of hot gases inside the stack and a column of air the same height;

3. Flue gases within the stack are of uniform density and constant temperature; or, if not, an average value is satisfactory for representation within practical limits; and

4. Head loss due to friction is directly proportional to the height and to the square of the rate of gas flow, and inversely as the fifth power of the diameter.

From the reduced formula and for the selected temperatures and densities, the minimum height stack and minimum diameter stack to provide the draft requirements are greater than those values given in Table 1.

Graphically, Table 1 values of H for an indefinite diameter are found by drawing index lines parallel to the D-scale, intersecting it an infinite distance away. Similarly, horizontal index lines (parallel to the H-scale) will give the values of D for infinite height chimneys.

Table 1. Minimum Stack Dimensions

Firing Rate C, Lb of Coal per Hr	H, Height in Ft. cannot be as small as:	D, Draft in Inches, cannot be as small as:
20	23	4.6
40	27	7.6
60	31	8.0
80	35	9.0
100	38	9.8
120	41	10.5

If the draft requirement for a particular fuel or grate is different from the I-B-R rating, or if the coefficients for temperature, density, friction, or barometric pressure are different, these values will be modified.

Example: What height of stack is necessary to burn 100 lb of coal per hr if the flue has an equivalent inside diameter of 13 inches?

(If the flue is square or rectangular, a chart of equivalent sizes would be used first to obtain the equivalent round diameter.)

Solution: Lay a straight edge across the point represented by 13 inches on Scale D and 100 on scale C and the height of the stack is found to be 50 ft on scale H.

There are always an infinite number of solutions for a given case if the quantity of fuel burned per hour is the only factor known. In the preceding example it will be found, for instance, that a chimney with a 15-inch diameter and a height of 43 ft or one of 12-inch diameter and a height of 58.7 ft would also satisfy the conditions. This characteristic of the chart is very helpful in the design of a new chimney. Cost estimates may be made for several different sets of values of diameter and height as read from the chart; and the proportions representing minimum cost may be determined.

Table 2. Economical Flue Sizes

Firing Rate, C, Lb of Coal per Hr	Limits of D for Minimum Cost, Inches
20	5.5— 8.5
40	8.5—11.5
60	10.0—13.0
80	11.5—14.5
100	13.5—16.0
120	14.5—17.5

The problem of modifying an existing chimney to handle an increase in load or a change to coal from some other form of fuel is not quite so flexible of solution because the diameter cannot be increased as readily as the height can. The example, presented above, represents this situation.

In connection with cost-height-diameter relationships, Table 2 is believed to represent reasonably closely the limits which will result in economical sizing.

Ventilation in the Graphic Arts

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Various processes in the printing and photoengraving industries release contaminants in the air such as dusts, mists, fumes, gases or vapors. Control measures through properly designed hoods and general ventilation are necessary to safeguard the health of the worker. Basic information is presented, including an extensive table which lists the various processes in the industry, the air contaminants and their potential hazard, and the recommended means of control.

IN 1940 were celebrated the 500th anniversary of the invention in Europe of printing from movable type and the 300th anniversary of its introduction to the North American colonies. During this span of time, the printing industry has grown tremendously and it is now the sixth largest industry in the United States employing at present about 780,000 people with a payroll of more than $2.5 billion.

This industry is characterized by relatively small shops. Only about 8% of printing firms in the United States employ more than 50 people and less than 1% of all printing plants have more than 500 workers.

The original processes have been improved and many new techniques are used in the graphic arts to reproduce images on paper, glass, metal and plastics. As a result, contaminants may be released into the atmosphere in the form of dust, mists, fumes, gases or vapors. If present in sufficient concentrations, these substances may create a hazard to the health of the workers and require control. Other materials or conditions, although not associated with definite health hazards, may create nuisance problems which require corrective measures.

From the standpoint of ventilation requirements, it is of no importance which particular printing technique is responsible for the release of an air contaminant. The governing considerations are rather the nature of the contaminant, its concentration, and the position of the operator relative to the source of contamination.

The printing technique will influence the specific design of the control measure. For example, essentially similar considerations are applied to the control of the lead fumes released by the backing-up operation used in the preparation of electrotype plates, or the lead fumes generated by a stereotype casting machine. For the purpose of this article it is convenient, therefore, to group the hazards and their controls according to the air contaminant associated with the various operations.

Control velocities and hood details specified are based on practical experience and the recommendations of experts in the field of industrial ventilation. It must be understood that in the designing an exhaust system based on the recommended air movements, the particular system resistance has to be taken into account. The control velocities should be of a magnitude sufficient to keep atmospheric concentrations of contaminants within acceptable limits and should overcome all factors tending to spread the contaminants.

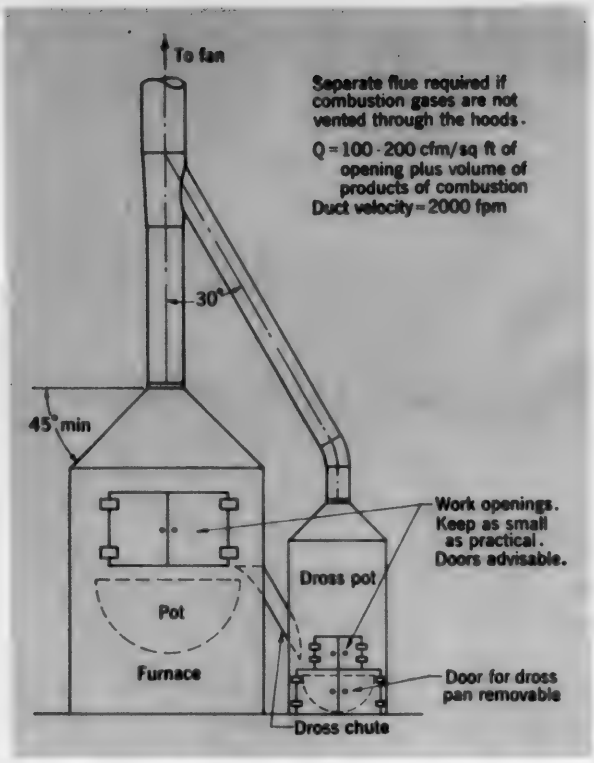

To fan
Separate flue required if combustion gases are not vented through the hoods.
Q = 100 - 200 cfm/sq ft of opening plus volume of products of combustion
Duct velocity = 2000 fpm
30°
45° min
Work openings. Keep as small as practical. Doors advisable.
Dross pot
Pot
Furnace
Door for dross pan removable
Dross chute

Fig. 1. Details of stationary furnace or melting pot.

It will be assumed that adequate, tempered make-up air is available to permit the exhaust systems to function at peak efficiency.

Control of Lead Fumes and Dust

Lead-containing alloys are used in a large part of the printing industry. The basic operation consists of melting the alloy, usually under thermostatically controlled conditions, casting the molten alloy and trimming and routing the cast plates, if necessary. The alloys also contain antimony in small proportions but it can be assumed safely that adequate control of the lead fumes and dust will eliminate any problem due to antimony.

Lead fumes in potentially hazardous concentrations are generated if the temperature of the molten alloy is not controlled properly. The correct temperature at which the metal can be cast without releasing excessive amounts of fumes varies according to the composition of the alloy used and ranges from 580 to 650 deg F. In the electrotype industry temperatures as high as 700 deg may be encountered. Some lead fumes are evolved, however, even at these relatively low temperatures and control by local exhaust ventilation is required. All lead-containing pots such as the large melting pots used in the newspaper plants and the electrotype industry should be enclosed as completely as possible and provided with self-closing doors, if possible. The system capacity should be based on an inward air velocity into all openings, ranging from 50 to 200 fpm. Ducts should be sized for a carrying velocity of about 2000 fpm. The volume of air required for effective control depends on the temperature of the metal, the percent of lead present in the metal, the surface area of the kettle, the activity, the amount of agitation, and the influence of cross drafts on the hood.

A melting pot furnace and its hood are shown in Fig. 1. In general, an inward velocity of 100 fpm will provide adequate control.

On occasion, rectangular tanks containing molten lead or a lead alloy are used in the electrotype industry. Steel trays are floated on the molten metal and heated. The molten metal then is poured on an electrotype plate in the tray as the backing.

The ideal hood for this operation is an enclosing hood, Fig. 2, with provisions for an inside monorail. For this hood, the typical face velocity varies from 50 to 100 fpm. depending on local environmental conditions.

A rear type hood, Fig. 3, may be used although the air volume required for good control will be considerably larger than for an enclosing hood. For the hood shown,

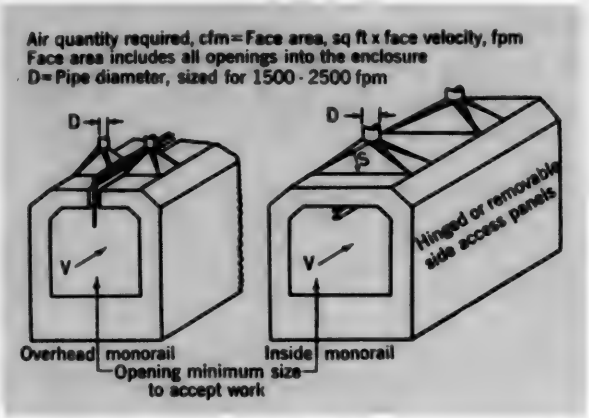

Air quantity required, cfm = Face area, sq ft x face velocity, fpm
Face area includes all openings into the enclosure
D = Pipe diameter, sized for 1500 - 2500 fpm
D
V
Overhead monorail
Opening minimum size to accept work
Inside monorail
Hinged or removable side access panels

Fig. 2. An enclosing hood with an inside monorail.

the slot width should be sufficient to maintain a velocity of 2000 to 3000 fpm. Air volume required is 200 cfm per sq ft.

It is poor practice to employ a canopy hood in this operation or any other operation which requires the operator to work over an open tank. In the many instances in which a canopy hood is used at present, conditions may be improved by the addition of side curtains and

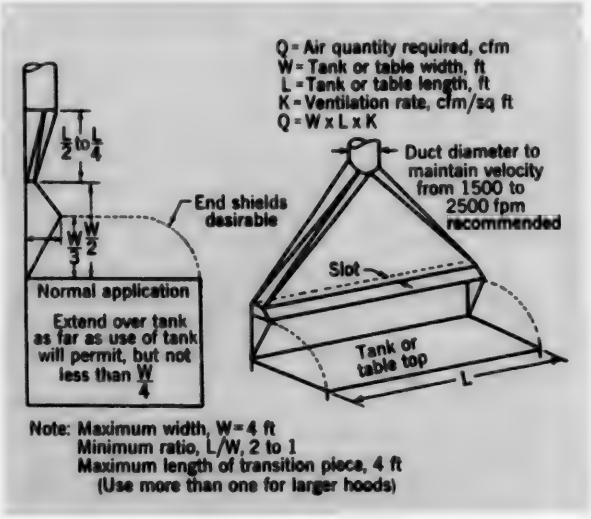

Q = Air quantity required, cfm
W = Tank or table width, ft
L = Tank or table length, ft
K = Ventilation rate, cfm/sq ft
Q = W x L x K
1/2 to 1/4
W/3
W/2
End shields desirable
Duct diameter to maintain velocity from 1500 to 2500 fpm recommended
Slot
Normal application
Extend over tank as far as use of tank will permit, but not less than W/4
Tank or table top
L
Note: Maximum width, W = 4 ft
Minimum ratio, L/W, 2 to 1
Maximum length of transition piece, 4 ft
(Use more than one for larger hoods)

Fig. 3. A rear type hood.

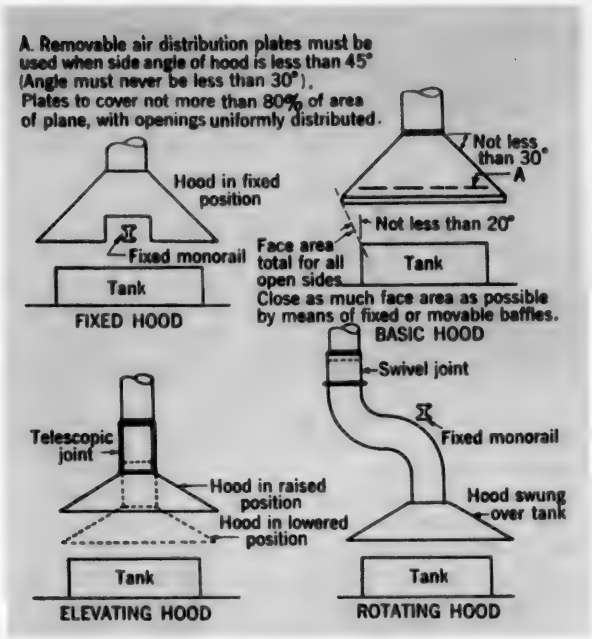

A. Removable air distribution plates must be used when side angle of hood is less than 45° (Angle must never be less than 30°). Plates to cover not more than 80% of area of plane, with openings uniformly distributed.
Hood in fixed position
Fixed monorail
Tank
FIXED HOOD
Not less than 30°
A
Not less than 20°
Face area total for all open sides
Tank
Close as much face area as possible by means of fixed or movable baffles.
BASIC HOOD
Swivel joint
Fixed monorail
Telescopic joint
Hood in raised position
Hood in lowered position
Hood swung over tank
Tank
ELEVATING HOOD
Tank
ROTATING HOOD

Fig. 4. Canopy hoods for use where operator does not work over tank.

baffles to direct the flow of air away from the operator.

A canopy hood for use where the operator does not work over the tank is shown in Fig. 4. Select a duct diameter to maintain a duct velocity from 1500 to 2500 fpm.

The formula to calculate air volume is:

$$Q = 1.4\ PVD$$

where

Q = air quantity, cfm
P = tank perimeter
V = desired velocity through face area
D = distance from tank to hood

Remelters

A standard canopy hood is appropriate, however, for the open pot remelter of less than 1 ton capacity which does not come equipped with exhaust ventilation. System capacity should be based on a control velocity of 50 fpm at the edges of the melting pot with due regard for thermal currents.

Martin W. Jeremias is a member of the Division of Industrial Hygiene, Department of Labor, State of New York. He received a B.S. degree from Columbia University and he has been active in the field of industrial hygiene for more than 10 years. Mr. Jeremias is a member of the American Conference of Governmental Industrial Hygienists and represents that organization as well as the International Association of Governmental Labor Officials on the newly created ASA Committee Z82 dealing with the "Safe Use of Cleaning Solvents in the Graphic Arts Industry".

The larger remelters are, in practically all cases, fully enclosed and are provided with hoods and/or exhaust duct connections. In modern practice, charging the remelter is mechanized through self-closing doors so that exposure is limited and exhaust system capacity need only be sufficient to provide inward air flow into all potential openings and to overcome the heat induced air currents.

It should be noted that, in general, casting from remelters and lead melting pots does not require exhaust ventilation.

Experience in the printing trades seems to indicate that carbon monoxide is a more significant hazard than lead in some cases and, in conformity with this finding, a properly designed hood for a gas-fired pot guards against the carbon monoxide gas as well as against the lead fumes.

A large number of machines, such as linotype machines and strip casters, contain small type metal pots as integral parts. It is generally accepted that electrically heated pots containing virgin metal do not require local exhaust ventilation. Gas-fired pots and those using contaminated metal require local control.

Through the years, a number of hoods have been developed which have proven effective in providing adequate ventilation. Some hoods for type casting and linotype machines are shown in Fig. 5. The hoods are characterized by an opening about 1 sq ft in area. Exceptions are the cone shaped hood or round duct found frequently over the gas ports of the monomelt pots and the Margach hood which has provisions for a self-feeding device. Air volume per hood should be 100 cfm and branch ducts should be sized for a velocity of about 2000 cfm which in effect means a 3-inch diameter duct

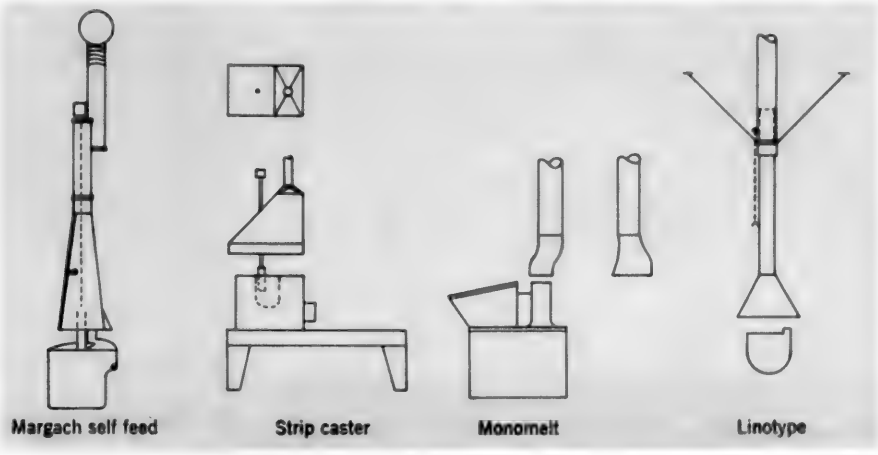


Fig. 5. Four designs of hoods for type casting and linotype machines.

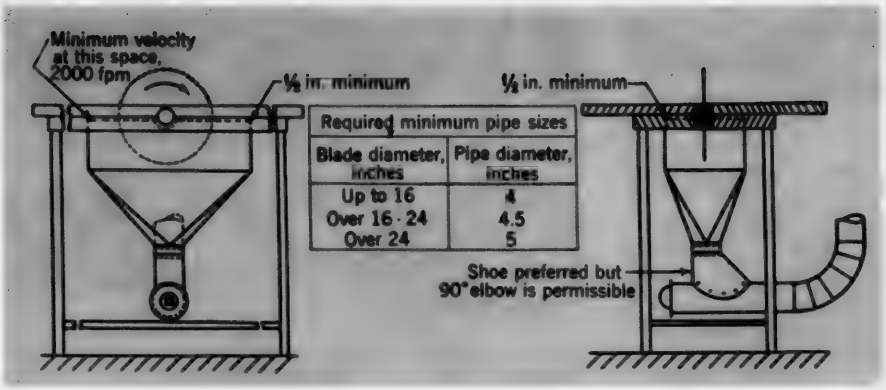


Fig. 6. Hood design for a table saw.

per hood. Care should be exercised to provide adequate clearance between the hood and the melting pots on units which tilt the pots during some phase of the operation; a telescopic joint, a ball joint or a swivel joint may be required for units which require that the table be raised.

One should note that in cases where the contaminants from a single slug or strip casting machine melting pot have to be controlled, that this may be achieved by a natural draft vent, provided the horizontal run of duct does not exceed 10 ft. It is good practice to pitch the horizontal run about 20 deg. A 45 deg cut-off is recommended for terminating the duct outside the building line. Other types of discharge are of doubtful merit since the additional resistance caused by 90 deg elbows and weather caps overcome any advantage due to uncertain wind currents which allegedly induce drafts.

Drossing and Skimming

Drossing and skimming operations are perhaps the most dangerous phases of lead alloy melting. These operations, in the majority of cases, are performed in a haphazard manner and it is not unusual to find accumulations of dross on the floor near lead pots or in open containers. The extremely fine lead oxide dust can be dispersed into the atmosphere by mechanical action inherent to the normal activities in the area.

Drossing operations are best controlled by the arrangement shown in Fig. 1. Under any circumstances, dross should be stored in closed containers and handling be kept to a minimum. It should be borne in mind that dross formation is related directly to the air movement over the surface of the molten metal and for this reason, over-designing of exhaust systems for lead melting pots should be avoided.

While drossing and skimming operations will generate dust of respirable size, it is doubtful that cutting and trimming operations produce particles of a size which will remain air-borne for any significant length of time. There is no question, however, that from an aesthetic point of view, it is desirable to prevent excessive accumulation of lead particles on the floor and it is equally desirable to prevent eventual dispersion of fine lead dust into the room air by sweeping or merely grinding under foot.

Handling Other Dusts

Dusts of metals commonly encountered in the printing industry (other than those of lead and antimony) such as zinc, magnesium and copper dusts are of a much lower order of toxicity, and control is indicated only when exposure is over a long period and dust concentrations are high. Zinc and copper dust released by routing operations can be controlled as indicated by a down draft grille worked into a table surface. Cutting and trimming operations can be controlled by the type of hood used for such operations in the woodworking industry. See Fig. 6. A substantial amount of woodworking operations are performed in photo engraving plants where work is done for the trade, and the hoods illustrated should be used.

Special precautions, however, are required for handling magnesium dust and chips unless all necessary safety features are included in the design of the system; an exhaust system may actually increase the hazard due to the pyrophoric nature of the metal.

Large quantities of so-called bronze powders, consisting of relatively small particle size of copper and zinc powders, are used to provide a "gold" finish. The complete operation requires application of the bronze powder, dusting with magnesium carbonate and then burnishing. This may be performed in one or several steps. Normally, the operation is fully enclosed and exhaust ventilation provided at a rate sufficient to provide good inward air

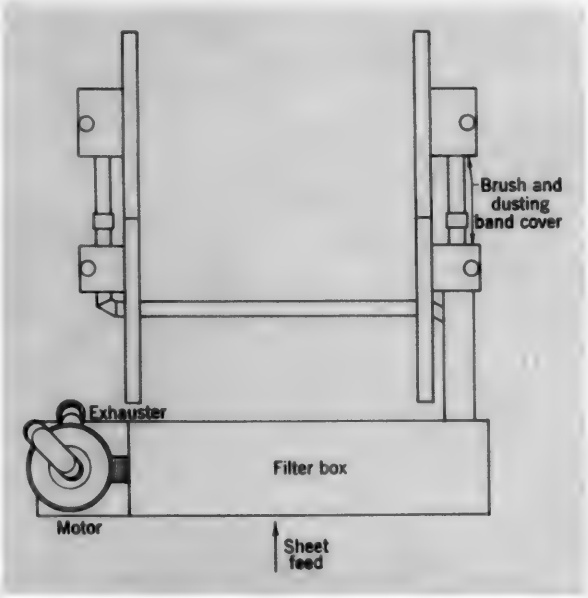


Fig. 7. Exhaust ventilation and separators for a German bronzer.

velocities into the machine openings. Ducts should be sized to give a carrying velocity of about 4000 fpm and the separator should have a ratio of bag or filter area to air volume of 1 : 3.

Difficulties arise in many cases due to inadequate provisions for removal of these materials and due to failure to remove separated material at the proper time, causing an increase in resistance resulting in loss of system efficiency. It is suggested that a pressure actuated device provided with a warning signal be installed in the system to indicate the need for filter replacement or cleaning. Dust receptacles should be an integral part of the exhaust system installation, permitting clean-outs as often as required and possible recovery of valuable material.

A modern bronzer imported from Germany, Fig. 7, is equipped with exhaust ventilation and separators which have some unusual features. The bulk of the dust is removed by an inertial separator acting as the primary. The air then is sucked through a box located on the floor underneath the machine. This box contains a cloth covered drum which retains most of the remaining dust on its surface and allows the cleansed air to pass on to the fan. The drum is rotated by hand at regular intervals and the accumulated dust is stripped off by a stationary, rubber tipped doctor blade and falls into a pull-out drawer from which it can be recovered conveniently. Behind the fan, the air passes into a can containing a machine oil to a level slightly below the air inlet. The turbulence causes formation of an oil mist which allegedly precipitates the fines that may have passed through to this point. A filter removes the oil mist and trapped dust before the air reenters the room.

Etching Lithographic Plates

In the preparation of lithographic plates for etching and during the etching operation, dusts are released which require control by local exhaust ventilation or other means. A slightly roughened surface is produced on lithographic plates by a graining operation. Here the plates are placed on a vibrating table and the desired finish is produced by the action of steel balls and quartz dust. In view of the highly toxic nature of the dust, it is essential to keep exposure to a minimum and this may be achieved most easily by wetting the silica powder to a moisture content of about 5%. This will prevent dust dissemination, and on immediate application of water will ensure proper distribution of the abrasive.

A canopy hood and a control velocity of at least 100 fpm between the hood and the table edges are recommended if the dust problems can not be controlled by wet methods.

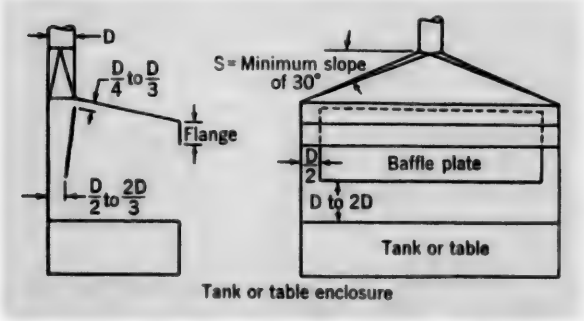
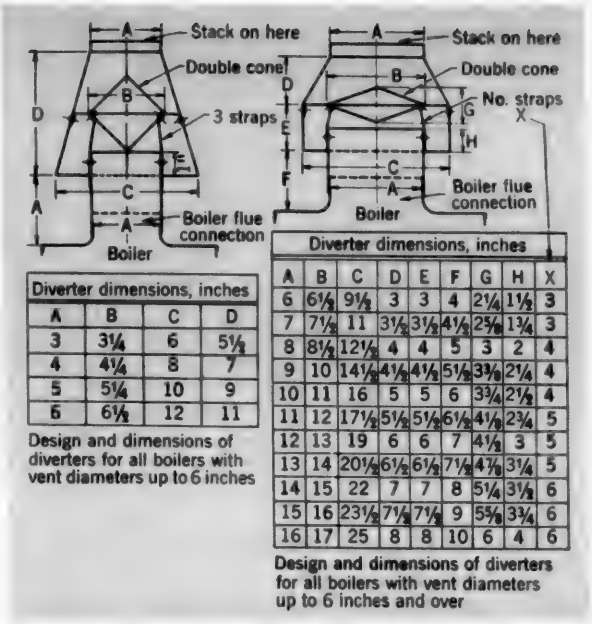


Fig. 8. Hood for use during the etching of lithographic plates.



Diverter dimensions, inches			
A	B	C	D
3	3¼	6	5½
4	4¼	8	7
5	5¼	10	9
6	6½	12	11

Design and dimensions of diverters for all boilers with vent diameters up to 6 inches

Diverter dimensions, inches								
A	B	C	D	E	F	G	H	X
6	6½	9½	3	3	4	2¼	1½	3
7	7½	11	3½	3½	4½	2⅝	1¼	3
8	8½	12½	4	4	5	3	2	4
9	10	14½	4½	4½	5½	3⅜	2¼	4
10	11	16	5	5	6	3¾	2½	4
11	12	17½	5½	5½	6½	4⅛	2¾	5
12	13	19	6	6	7	4½	3	5
13	14	20½	6½	6½	7½	4⅞	3¼	5
14	15	22	7	7	8	5¼	3½	6
15	16	23½	7½	7½	9	5⅝	3¾	6
16	17	25	8	8	10	6	4	6

Design and dimensions of diverters for all boilers with vent diameters up to 6 inches and over

Fig. 9. Diverters for boilers with vent diameters smaller and larger than 6 inches.

Dragon's blood powder (red resin) is used during the etching of lithographic plates and it is standard procedure to apply the powder in an enclosure similar to a small spray booth, Fig. 8.

Control velocities of 50 fpm through the face of the hood are adequate. Duct velocities need not exceed 3000 fpm and little if any of the powder is lost through the exhaust system.

Reactions ranging from mild annoyance to severe allergic attacks may be produced by powders released during the application of non-offset powders or sprays, the reaction depending mainly on individual susceptibility and degree of exposure.

Non-offset powders or sprays usually contain talc, dextrin, gums and starches, or any combination of these materials, and fairly high dust concentrations may be built up. At one time, free silica represented a serious problem. This compound has been largely eliminated in the formulations now in common use. In cases of allergic individuals, the condition can assume a hazardous aspect.

A canopy hood, Fig. 4, will provide adequate protection for non-allergic individuals and will prevent dissemination of the powders throughout the entire workroom even with low control velocities.

A similar problem is encountered in the application of non-slip powders. While local exhaust ventilation with control velocities of at least 100 fpm is a requirement for the use of powders containing free silica, general ventilation is acceptable in most cases.

Paper cutting also produces dust, primarily from the coating, namely sizing, pigments and fillers, and allergic individuals may be affected.

General ventilation, about which more will be said later, is used frequently to provide a measure of control for dusts of non-specific toxicity in low concentrations.

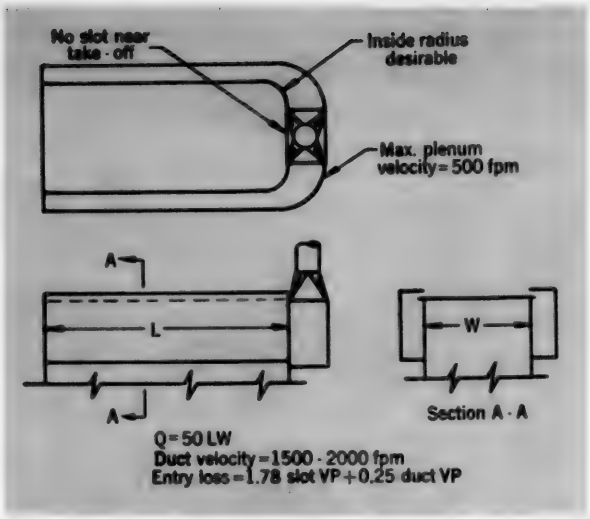


Fig. 10. Hood for solvent degreasing tanks.

Special Processes

The printing of ceramic decalcomanias for the china ware trade requires special precautions due to the high lead content of the fluxes, and some pigments which are applied in powder form. The lead-containing dust is disseminated into the atmosphere at the well and also at the discharge end of the printing press where the sheets are stacked. Close supervision is exercised. In modern practice a rotary press with burnishing pads is used and the well, drum and rollers are as completely enclosed as possible. Ventilation is designed to give a control velocity of 150 fpm into all openings.

The stacking end of the machine presents a difficult problem in providing effective control without interfering with the operations. A slot hood, with appropriate baffles, has been found adequate to keep contaminant concentrations within acceptable limits.

Some mention should be made of a few highly specialized processes in the manufacture of greeting cards and novelties which may produce nuisance dusts. In most cases, simple enclosure provides sufficient control for the tinsel, metal powders or fibers used. A high speed operation, however, should exhaust enough air from the enclosure to provide an inward air movement. The potential fire and explosion hazard associated with some of the materials requires safeguards such as grounding, electrostatic eliminators and appropriate electrical units.

A canopy hood, or preferably an enclosing hood, is adequate to prevent the dust and fumes released during the thermographic process from contaminating the workroom atmosphere. The air volume should be based on a positive air flow into all openings between hood and the source of contaminant with due regard for the thermal air currents created by the printing technique.

Gases, Vapors, Mists

The printing industry uses a prodigious number of solvent containing materials which in their physiological action range from the most toxic to the mildly narcotic substance. Application varies from hand operations requiring minute attention to detail to fully automatic, high speed processes.

It is a peculiarity of the industry that the many printing processes are amenable to variations dictated by individual preference or the requirements of a particular job. For this reason, recommendations of exhaust ventilation systems have to be couched in general terms and actual application has to be tailored to individual installations.

A commonly encountered potential hazard is due to carbon monoxide gas released by improper combustion. Open flames such as are encountered in the burning-in operation during the preparation of lithographic plates, do not require ventilation control but it is important to maintain proper burning as judged by the blue color of the flame. As pointed out previously, the exhaust ventilation provided for gas-heated melting pots should be designed to assure control of the products of combustion. Gas-heated cabinets have to be provided with back draft converters, Fig. 9, and vented. Considerations outlined in connection with the venting of single, gas-heated linotype pots apply.

The air contaminants encountered in practically all dark rooms are ammonia gas and acetic acid vapors with concentrations ranging from almost nil to strongly-annoying, when solutions are freshly prepared. Although there is no question that general ventilation should be provided in dark rooms, this area is neglected too often due to the false notion that exclusion of daylight necessarily implies exclusion of a fresh air supply.

About 12 to 15 air changes per hour are desirable. The air quantity required in cubic feet per minute is obtained by multiplying the cubic content of the room by the number of air changes desired and dividing by 60. No problem arises in providing the exhaust since recirculation of the vitiated air should be avoided and the air can be removed to the outdoors by an exhaust system serving other parts of the plant, or a separate system. Since the room serves as a plenum, and the dimensions are usually small, it is of little importance where the exhaust intake is located unless it can be located in close proximity to the critical area. A judicious location of the supply air inlet, may, however, contribute some of the benefits of a local exhaust installation by directing a flow of air over the source of contamination away from the operator, if this inlet is the only means of entry for the air. The air inlet has to be provided with an efficient light trap and possibly filters and should be sized so that the air velocity does not exceed 300 fpm. Since most dark rooms are relatively small, the inlet air velocity specified can provide a measurable air movement at an area of interest and can therefore enhance the benefits of general ventilation as outlined.

Carbon arc lamps are the source of ozone gas which is very toxic. This gas can be troublesome even though released intermittently at low concentrations. Most lamp housings are provided with an attachment for a flexible duct which can be used with a vent duct if the distance to the outdoors does not exceed 20 ft and any horizontal run is kept to 10 ft or less—or as a connection to the branch pipe of an exhaust system. Good practice indicates that the length of flexible duct should be kept to a minimum and rigid ducts be used whenever feasible to lessen system resistance. The amount of air to be moved is small (a control velocity of 75 fpm into the lamp housing is suggested) and should have no adverse influence on the performance of the apparatus. General ventilation is not recommended as a means of control.

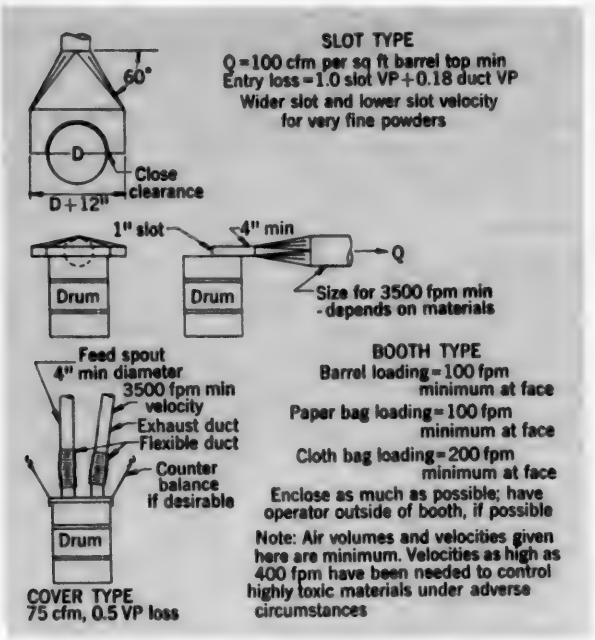


Fig. 11. Slot type hood for use with drums.

The spray booth so commonly encountered in industry finds relatively little application in the printing field. Some isolated operations such as the spraying of a silver coating to assure conductivity for the plating of electrotypes, the spraying of various solutions to bring out or dull the highlights on objects to be photographed, call for the use of a spray booth.* Control velocities of 100 fpm are adequate for normal use but higher velocities are indicated if highly toxic solvents such as carbon tetrachloride are used in spraying operations. Kromo-lite spraying should be done in a hood.

A spray booth type hood can be used to excellent advantage as an enclosure for molding and curing presses to remove the obnoxious fumes and gases released during the vulcanizing of rubber or composition printing plates.

Open Surface Tanks

Another rarely encountered hood is the type used for solvent degreasing tanks, Fig. 10, which find some application in the cleaning of lithographic plates.

The recommended air volume is 60 cfm per square foot of open tank surface if the necessary controls are provided, such as thermostatic controls in the boiling chamber and above the vapor zone, cooling coils and the proper free board. A higher air volume may be needed if these controls are not present. A separate vent is required for the products of combustion if the degreaser is gas heated. The hood can be used also to advantage on the acid tin plating tank used by some electrotype manufacturers although control is important only during the preparation of a new plating solution and the plating out of impurities. In fact, the hood can be used for any of the open surface tanks used in the electrotype industry to control mists released by high speed, hot plating operations or even steam from a hot water rinse tank. Air volume requirements may vary from 75 cfm to 150 cfm per square foot of tank surface depending on the shape and location of the tank, the hazard potential of the air contaminant, the temperature of the bath, the rate of gassing (plating efficiency) and amount of agitation.

Vapors from Solvents

Trichlorethylene which is the usual solvent in a degreaser finds a unique application in the newspaper printing field where it is used as the solvent on certain types of pasters. The web is wetted with the solvent to activate the pasting material and a length of paper becomes saturated in the process resulting in repeated, minor exposures at locations far removed from the point of application. Control is required at the pasters to remove any excess spray. A canopy hood above the spray nozzles and as close to the web as possible is suggested if such an arrangement is feasible. If not, general ventilation is indicated and the air volume required is determined by the solvent use, the maximum allowable concentration, and the nature of the material used according to the following formula.

$$\text{Cu ft air per pint solvent evaporated} = \frac{403 \times \text{specific gravity of solvent} \times 10^6 \times K}{\text{molecular weight of liquid} \times MAC}$$

$$\text{Cu ft air per pound solvent evaporated} = \frac{387 \times 10^6 \times K}{\text{molecular weight of liquid} \times MAC}$$

K is a design and safety factor and ranges from 3 to 10 depending on a variety of factors. Generally, 6 is a satisfactory choice. *MAC* stands for maximum allowable concentrations and the numerical values are given in terms of parts of air contaminant per million parts of air (ppm), milligrams of contaminant per cubic meter of air (mg per cu m), or million particles of dust per cubic foot of air (mppcf). This figure represents the maximum, average atmospheric concentration to which a worker may be exposed for an eight-hour day without impairment of health. These values are subject to review and are based on practical experience and experimental studies. The *MAC* serves a useful function as a guide in the control of industrial hazards but should not be regarded as a rigid dividing line between safe and unsafe concentrations. It has to be used in conjunction with a number of other factors to evaluate short-term, acute exposures.

The formula should be applied whenever local exhaust ventilation is not feasible and general ventilation is used as a means of control of solvent vapors. Since we are dealing in most cases with a variety of solvents, the design characteristics should be based on the most toxic solvent present and synergistic effects of various solvents if known, should be taken into consideration.

From a study of the formula, it is evident that the volume of air to be exhausted is directly proportional to the amount of solvent used and the toxicity of the material. Since normally little can be done to decrease the amount of solvent used, a major effort should be

* For a discussion of spray booths see Spray Booths with Paint Filters, S. Marlow, *Air Conditioning, Heating & Ventilating*, Oct., 1957, p 83-87.

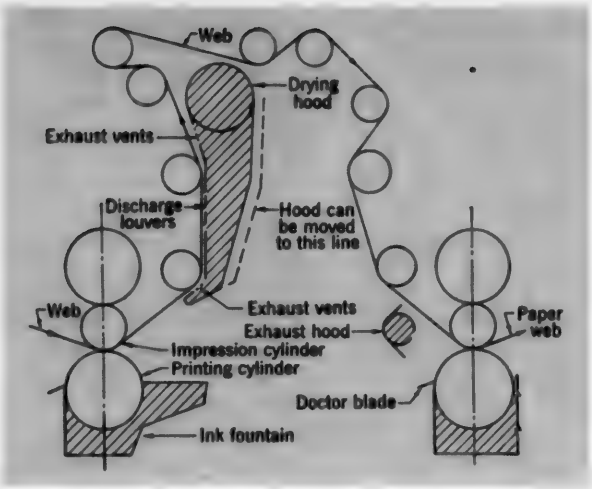


Fig. 12. Hood used in connection with fast roto-press.

made to avoid highly hazardous materials such as carbon tetrachloride, benzol and carbon disulfide. When purchasing proprietary formulations, it is strongly recommended that the exclusion of these mentioned solvents from the formulation be specified.

Information about the relative toxicity of various solvents can be obtained from tables in a number of books on industrial hygiene or pamphlets published by several organizations.

A great variety of solvent formulations, many proprietary in nature, are used to wash rollers, blankets, ink and paint troughs and forms. Local exhaust ventilation may be impractical or uneconomical, depending on the construction of the press and the frequency of the cleaning operation. A similar situation prevails in regard to the printing operation itself, whether on paper, plastic or metal, whenever inks and paints high in solvent content are used and general ventilation may be the only solution.

It is axiomatic, however, that local controls should be utilized whenever possible.

Solvents and solvent-containing materials should be stored in accordance with NBFU regulations and the requirements of the local Fire Department regulations. Storage cabinets should be vented to the outdoors and storage rooms adequately vented or exhausted with provisions for proper make-up air from outdoors. If the storage area is used for mixing and blending, exhaust ventilation at the rate of 50 fpm through the room cross section should be provided. A slot type hood, Fig. 11, around half the periphery of a mixing drum is advisable where general ventilation is inappropriate. Proper safeguards against the fire and explosion hazard are essential.

The canopy hood is easily adapted to control the vapors released from a trough and roller particularly when the hood can be brought close to the source of contamination and any work that has to be done on the roller can be performed by a worker not standing underneath the hood. In many cases, hood construction of transparent material permits efficient location; the use of flexible and possibly transparent side curtains assures good control of the solvent vapors without excessive exhaust air volumes.

Such a hood can be regarded as an enclosure and, depending on the construction of the printing press, the hood can be so located that the rollers are at least partly within the hood. In this manner a definite control is provided. Telescopic or swivel joints should be considered in the design of these enclosing hoods to permit effective control during operation and ease of manipulation during make-ready. A control velocity of 75 fpm between the hood and the rollers should be provided.

Controlling Solvent Vapors

Solvents are released continuously during the printing process from the moment the solvent-containing material is dispensed and applied, until all solvent is evaporated. And ideally, all solvent vapors should be removed by exhaust ventilation. From a practical standpoint, however, this is neither possible nor necessary. The evaporation rate of the solvent used generally determines where local control is mainly required during the process. To cite some examples: Printing with inks dissolved in low boiling solvents such as methyl ethyl ketone (MEK) will require control mainly during the initial phases of the process at the trough and rollers; a silk screen operation using high boiling solvents such as V M & P naphtha may require control only for the drying operation during which the bulk of the solvent is released. A solvent formulation covering a wide range, may require control at all phases of the process.

These general remarks indicate the difficulties inherent in the problem of controlling solvent vapors and these difficulties are further increased by the great number of arrangements possible with the types of printing presses in modern use, ranging from the simple, hand operated silk screen press to the multicolor rotary press so adaptable to different printing problems.

A slot type exhaust hood is well suited for removing the solvent vapors released at a trough, provided uniform control velocities can be achieved along its entire length and it is physically possible to erect such a hood. A narrow slot leading to a tapered plenum has been used

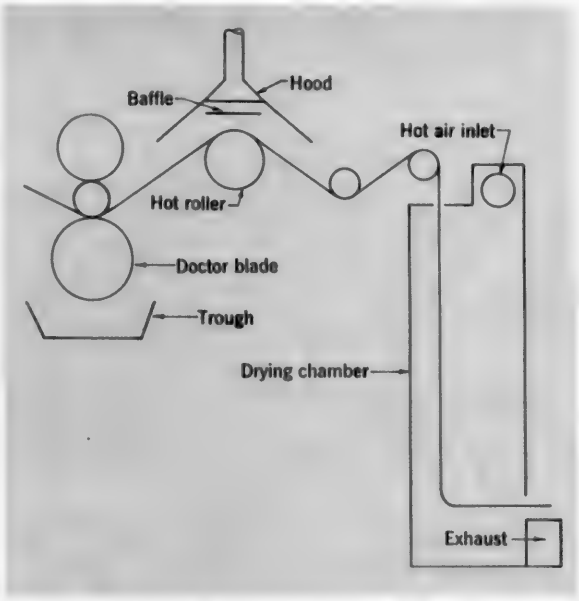


Fig. 13. Diagram of layout of ventilation for Camotone rotogravure.

successfully (see Fig. 10) but it was necessary to allow for removal of the hood to permit handling of the trough. A control velocity of 50 fpm at the edge of the trough nearest the operator is recommended.

In this connection, it must be emphasized again that local exhaust ventilation is only effective if the hood can be located close to or enclose the source of contamination, or unreasonably high air volume must be used.

Special problems arise when heated rollers are used to promote drying and/or a stream of air which may or may not be heated is used also for that purpose. There is no question that control is required for the heavy concentrations of solvent vapors liberated.

Printing on collapsible, metal tubes by the roller coating technique also releases large amounts of solvent vapors and control, by means of enclosing hoods which are exhausted at the rate of 100 fpm is recommended.

The operation is unique for the printing can be removed and the commercially valuable tubes recovered. The paint is removed usually in closed systems by hot solutions containing alkali, creosolic compounds and solvents. A complete enclosure and high exhaust rates are required.

Two noteworthy examples of ingenuity applied to the solution of problems involving solvent vapors are illustrated by Figs. 12 and 13.

The volume of air removed should exceed the volume of (heated) air supplied by a sufficient margin to assure a positive air movement into all openings of an enclosure made as illustrated. The amount of excess air may vary from 10 to 50% depending on hood construction, thermal head, and web speed.

After the web passes the rollers, it may be practically dry or require oven drying. Drying ovens for heat set inks fall also in this category.*

Figure 14 illustrates a variant of a hood to promote drying and remove the contaminated air.

Solvents, solvent-containing materials, etching and other compounds which release air contaminants, are used extensively in the preparation of lithographic plates. The down draft deep etch table, Fig. 15, is in common use and assures good control provided a sufficient air volume is removed. A minimum air volume of 100 cfm per square foot of table surface is recommended. The common practice of exhausting through slots on the four sides of the table is highly objectionable and good procedure indicates exhaust on three sides only, and blanking off the operator's side to assure an air movement away from his breathing zone. Recirculation should be avoided and use of fire and explosion proof electrical equipment and non-sparking fan are necessary.

In the many instances in which solvents are used in sinks for the cleaning and scumming of lithographic plates, a rear type hood can be used to achieve the required control.

Deep etching by hand with nitric acid solutions in conjunction with the use of dragon's blood is a widespread technique in the lithographic industry. An enclosing hood is used and a control velocity of 50 fpm is adequate. Many hoods are deficient in construction, however, due to lack of proper baffles to assure uniform air movement.

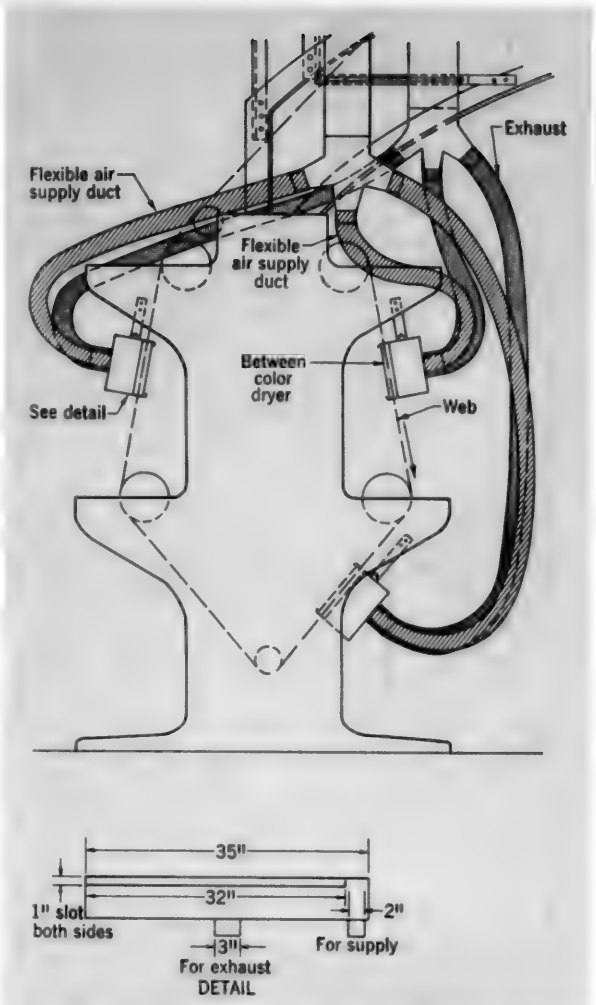


Fig. 14. Exhaust for print drying, Mason Envelope machine.

Powderless Etching

A significant advance in etching technique has been achieved by the use of the so-called "powderless etching" machines which are commercially available and find increasing application. Some of the latest models of these machines are provided with internal ventilation based on an air volume of about 110 cfm per square foot of tank surface while others, although provided with a vent, need additional exhaust ventilation.

The vent supplied with the machine is provided with a sliding bypass and a small fan. Exhaust volume is based on 110 cfm per sq ft of tank surface. A baffle fastened on the machine cover has been used to close off the hood opening while the machine is in operation. This device was adopted because the exhaust dust leads to a plenum and the ventilation at individual machines is not subject to control. In other installations, a pressure switch activated by the machine cover was used to turn on the fan motor. Ventilation is required only for a brief period after the etching action to remove the saturated atmosphere between the liquid level and cover.

Etching with ferric chloride solution does not require control.

* Ventilation of Industrial Ovens by B. Feiner and I. Kingsley, *Air Conditioning, Heating & Ventilating*, Dec., 1956, p 75-80.

TABLE I—RECOMMENDED MEANS OF CONTROL AND AIR VELOCITIES FOR HOODS USED IN GRAPHIC ARTS

Typical Operations	Air Contaminants	Hazard Potential	Fire and Explosion Hazard	Recommended Means of Control	Minimum Air Volume or Control Velocity	Air Velocity in Branch, fpm	Remarks
Linotype, intertype Ludlow, monotype Elrod	Lead fumes Lead oxide dust Carbon monoxide	Low High Medium	None	Special hoods above melting pots	1000 cfm per hood	2000	Telescopic or swivel joints may be required. No exhaust required for electrically heated pots using virgin metal. Venting is adequate for single machines. Temperature control recommended. Dross must be kept in closed containers.
LETTER PRESS PRINTING PLATES							
Stereotypes Melting, casting	See above plus oil and ink fumes	High	None	Enclosing hood with self-closing doors. Provisions for dross	100 fpm through openings	2000	Vent products of combustion separately if not exhausted through hood; provide vent with backdraft diverter. Temperature control recommended.
Routing, trimming	Lead dust	Low	None	Hood back of saw blade	350 cfm	4500	Dross must be kept in closed containers. Provide baffles around operation.
				Down draft	150 cfm/sq ft work area	4500	
ELECTROTYPES							
Backing up	See Stereotype	High	None	Enclosing hood	100 fpm through openings	2000	See above. Re: lead melting operations.
Silver nitrate spray	Ammonia	Medium	None	Spray booth	100 fpm	2000	
Routing, trimming	Metal dust	Low	None	See above			
Plating	Cyanide mist; copper plating	Low	None	Lateral slot hoods	Varies; at least 75 cfm per sq ft tank surface	2000	Size slot for velocity of at least 1000 fpm.
	Acid mist; tin plating	Low					
Blocking	Wood dust	Low	Yes	Wood working hoods	Varies; at least 350 cfm per cutting tool	4000	Required only in production shops.
RUBBER PLATES							
Vulcanizing	Organic fumes; breakdown products	Low	None	Enclosing hood with baffle	100 fpm	2000	
PLASTIC PLATES	See above						
				PHOTOENGRAVING			
Developing	Ammonia, acetic acid	Low	None	General vent. in dark room	50 fpm through room cross section		
Exposing	Ozone	Medium	None	Vent to outer air or exhaust 75 cfm per lamp		2000	Kromo-Lite spraying in booth—100 fpm through opening.
Flat etching (hand)	Nitric acid, oxides of nitrogen	High	None	Enclosing hood	50 fpm	2000	
Powdering	Dragons blood	Low	None	Enclosing hood	50 fpm	2000	
Hardening	Carbon monoxide	Low	None	Vent to outer air			
Powderless etching (Dow)	Oxides of nitrogen, solvent vapors	High	Slight	Internal exhaust or side slot exhaust	100 cfm per sq ft tank surface	2000	
Powderless etching (Acme)	Ammonia	Low	None	As above	As above	2000	Watch storage of chemicals.
Deep etch preparation						2000	
Lacquering, scumming, painting out, etc.	Solvent vapors, acid mix	Medium	Med.	Down draft tables; rear load for sink	As above		
Graining	Silica dust	High	None	Canopy	150 fpm through face		Wet method of control is acceptable.
Blocking Routing, trimming	See under electrotypes						
Degreasing	Chlorinated solvent vapors	High	None	Side slot hood	60 cfm per sq ft tank surface	2000	Consult NBFU standard No. 48 for magnesium. Size slot for at least 1000 fpm; for chlorinated solvents provide additional safeguards.
	Solvent vapors	Medium	Med.				

TABLE I (Continued)—RECOMMENDED MEANS OF CONTROL AND AIR VELOCITIES FOR HOODS USED IN GRAPHIC ARTS

Typical Operations	Air Contaminants	Hazard Potential	Fire and Explosion Hazard	Recommended Means of Control	Minimum Air Volume or Control Velocity	Air Velocity in Branch, fpm	Remarks
				PRINTING PROCESSES			
SOLVENT VAPORS							
Storage	Solvent vapors	Medium	Yes	Vent or exhaust cabinets and rooms depending on quantity	5 cfm per sq ft gross floor area		See NBFU standards No. 30 and No. 42. Standards apply to all operations producing high vapor concentrations.
Mixing	Solvent vapors	High	Yes	Drum exhaust General exhaust	100 cfm per sq ft 50 fpm per room cross section	2000	
Roller, blanket form washing	Solvent vapors	High	Yes	General exhaust Slot exhaust	50 fpm per room cross section 50 fpm at edge	2000 2000	Slot exhaust preferred; hood may be detachable. Avoid formulations containing highly toxic solvents.
Ink dispensing systems	Solvent vapors	High	Yes	Canopy	50 fpm through area between hood and trough	2000	
Silk screen printing	Solvent vapors	High	Yes	Rear type hood or general exhaust	50 cfm per sq ft of screen	2000	Provide exhaust for drying area.
Silk screen washing	Solvent vapors	High	Yes	Provide enclosure, exhaust rate 50-100 fpm, depending on solvent and whether hand or mech. operation	50 to 100 fpm		Dry in enclosure.
Pasting	Chlorinated solvent vapors	High	No	Canopy or slot hood, if possible	Use dilution formula		
Web drying	Solvent vapors	High	Yes	Special hoods			
Oven drying	Solvent vapors	High	Yes	See article			
				DUST			
Dry printing	Lead containing dust	High	No	Enclose operation	150 fpm through all openings	3000	
Bronzing	Copper and tin dust	Low	No	Enclose operation	Inward air flow	3000	Provide efficient collector.
Non-offset spray	Organic and talc dust	Low	No	Canopy hood or general ventilation	50 fpm	3000	

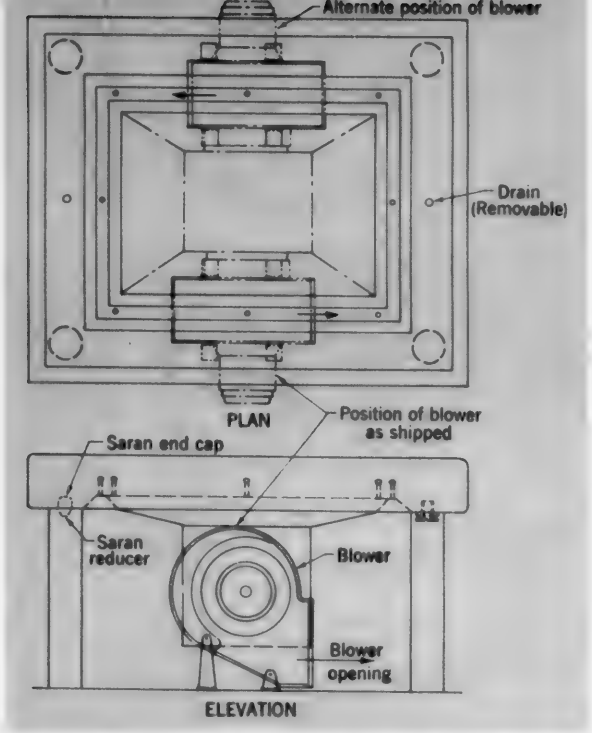


Fig. 15. Exhaust for a deep etch table, Zarkin Machine unit.

Silk Screen Printing

Silk screen printing also releases large amounts of solvent vapors. Since the solvents used are generally slow drying, the printing process itself generally presents less of a problem than the drying phase of the operation. Good general ventilation is adequate in most cases unless the printing is done by high speed mechanical means in which case a rear type hood and an exhaust system capacity of 50 cfm per square foot of silk screen table are recommended.

Air drying should be done in an enclosure or room exhausted at the rate of 50 fpm through its cross sectional area. It was found that variable speed fans operated by time clocks for short periods during non-working hours, did an excellent job of controlling solvent vapors. The vapors had accumulated overnight during the air drying of silk screened plastic sheets and had caused a serious neighborhood complaint.

Silk screen washing with organic solvents, a necessary part of the silk screen printing industry, should be done under controlled conditions. Control requirements vary depending on the technique used and the toxicity of the solvent. Generally, a velocity of 50 fpm through the operator's breathing zone is adequate for hand scrubbing operation while 100 fpm may be required for hose washing.

The spirit duplicating machine may serve as a good example for a variety of office reproducing machines which may release solvent vapors or other gases. The use of these machines in small offices without exhaust ventilation is not recommended. While air conditioning in steady use should be installed with an enclosing canopy hood over the receiving tray. The exhaust air volume should be based on at least 75 fpm through all openings into the hood.

General Ventilation

In this connection, a few more words should be said about general ventilation which may be (1) natural, due to the action of wind through wall openings and the up-draft caused by the difference in temperature between indoors and outdoors; or (2) mechanical.

Solvent vapors, to all intents and purposes, are not heavier than air. The all too common use of a general, mechanical exhaust system near floor level is based on faulty reasoning. The solvent-air mixtures normally encountered during printing operations are not significantly heavier than clean air.

Ventilation rates based on room volume only, that is, on the number of air changes, have little validity. This approach should not be used unless the evolution of air contaminants are at a slight and fairly steady rate and the overall object is comfort rather than protection from a health hazard.

The limiting factors in general ventilation are usually cold weather conditions and the availability of heat.

The governing principle in general ventilation is the dilution effect. The previously mentioned formula should be used whenever the necessary information is available in regard to solvent type and use.

General ventilation may be required to prevent the build-up of nuisance dust concentration. A suggested design basis is an air movement of 50 ppm through the room cross section but the excessive air volume makes such an approach impractical in most cases. Although the beneficial effect of this type of exhaust is mainly psychological, its merits cannot be underestimated.

A circulating fan of the pedestal type or mounted on the wall may be used to provide air movement in a dead air space or promote directional air flow in conjunction with general exhaust ventilation. In the latter case, the operator should be stationed between the fan and the source of contamination.

Ventilation and Air Conditioning

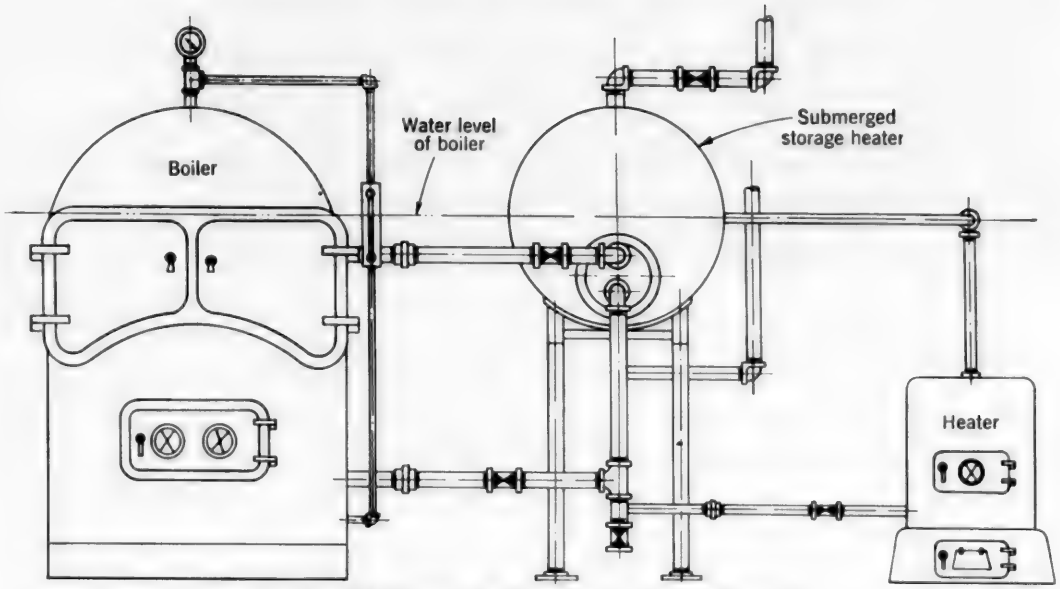
Air conditioning in printing establishments is common today and exhaust ventilation requirements can easily put a severe strain on an air conditioning system or even make the installation of such a system unfeasible since the conditioned but contaminated air cannot be recirculated, in most cases. Careful attention to reconciling exhaust system requirements with air conditioning system capacity, is a must.

Table I serves as a guide in specifying for the various techniques in the graphic arts, the recommended means of control, the proper air volume and velocity and the air contaminants that may be encountered.

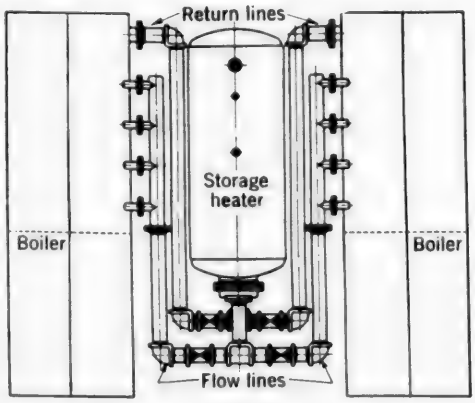
Credits

Figures 1, 10 and 11 are from Industrial Ventilation Manual, courtesy of American Conference of Governmental Industrial Hygienists. Figures 2, 3, 4, 6, 8, and 9, courtesy of Division of Industrial Hygiene, New York State Department of Labor.

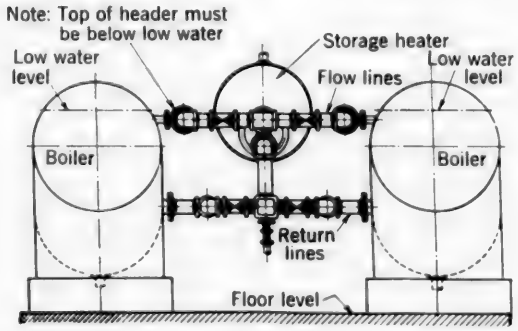
HOOKUPS FOR STORAGE HEATERS

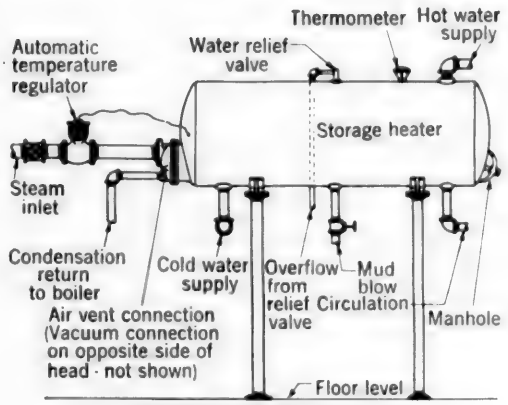


SUBMERGED STORAGE HEATER WITH TWO HEAT SOURCES



SUBMERGED HEATER WITH TWIN BOILER INSTALLATION

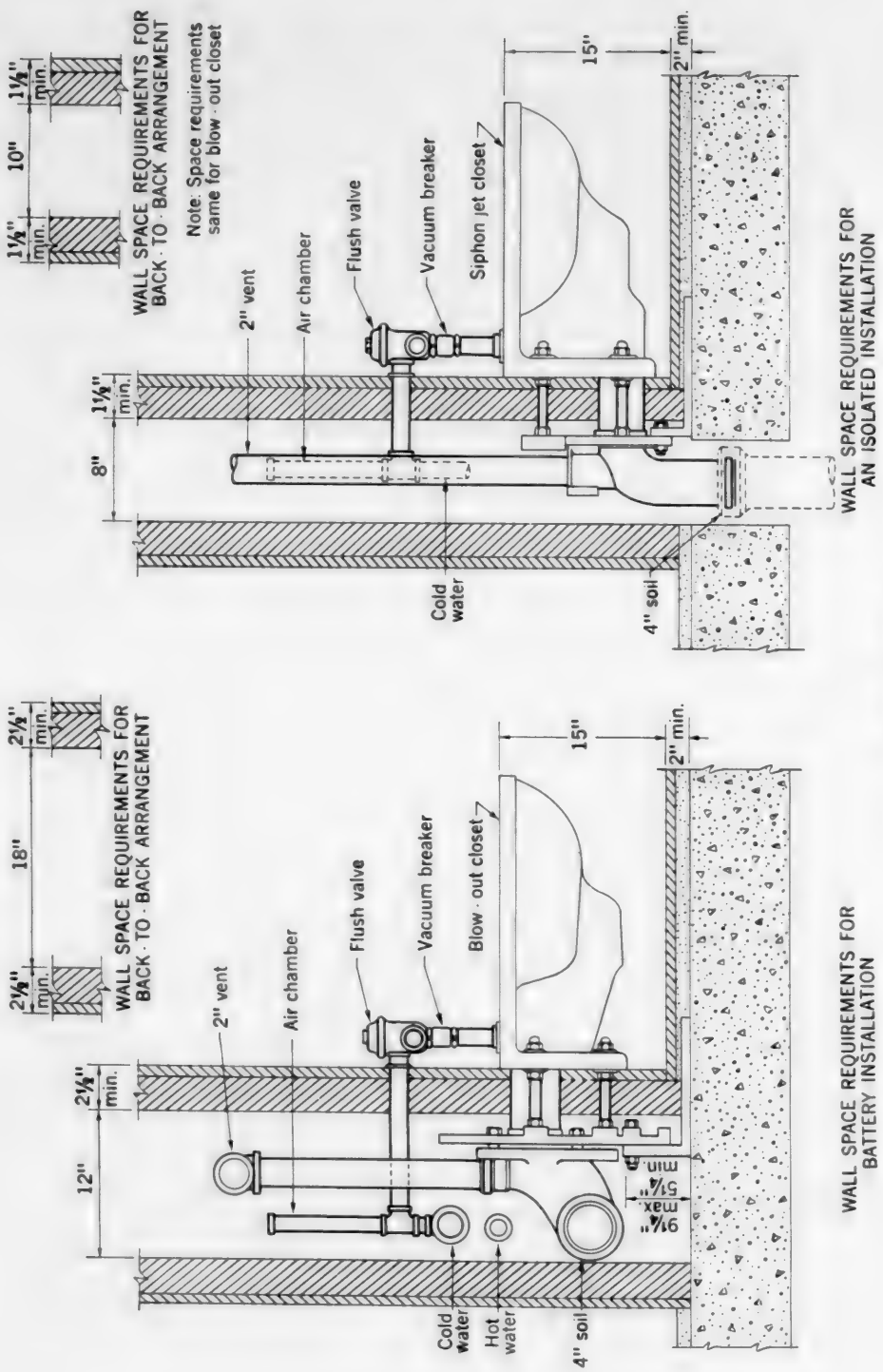




STANDARD HEATER HOOK UP

Drawings courtesy of
The Whitlock Manufacturing Co., W. Hartford, Conn.

WATER CLOSET INSTALLATIONS



Drawings courtesy of
Syska & Hennessy, Inc., Consulting Engineers,
New York, N. Y.

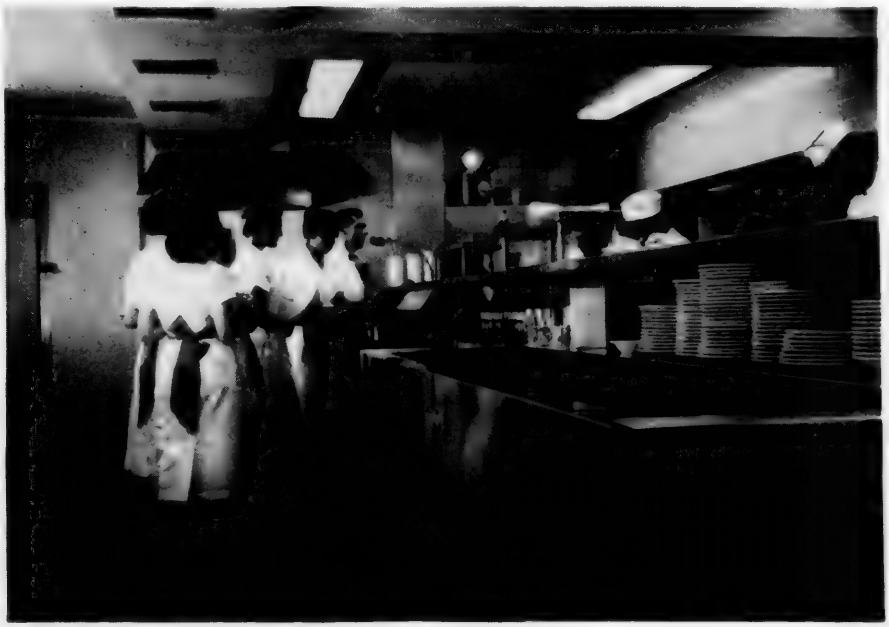
One of the chain of Maisels restaurants, in Miami Beach, Fla.

Restaurant Air Conditions Its Kitchen and Dining Areas

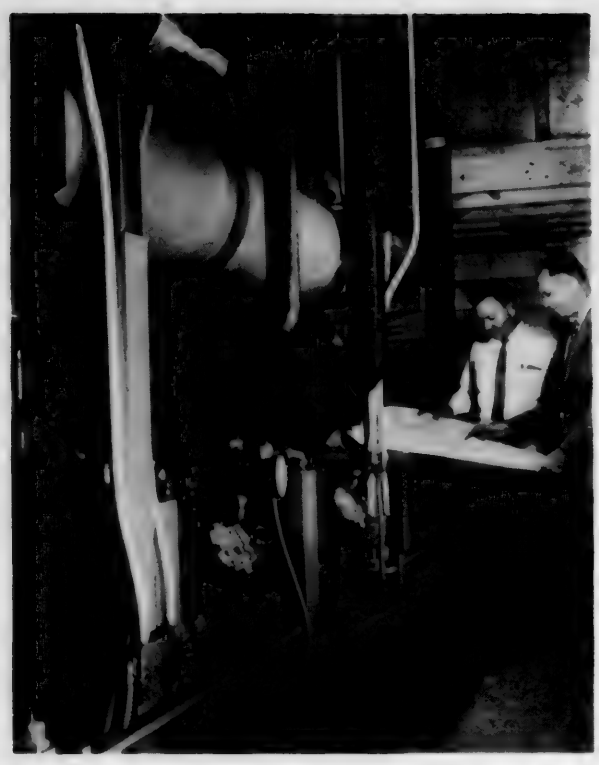
An unusual air conditioning system which cools the kitchen and service area, as well as dining rooms of a new restaurant in Miami, Fla.

ALTHOUGH air conditioning for restaurants is now general practice, the new Maisel's Restaurant in Miami Beach, Fla., is noteworthy because air conditioning and ventilation systems were installed to cool the kitchen and service area. This restaurant was planned for fast service to customers and for assurance that there would be no interruption in the air conditioning system due to mechanical failure. As a point of interest, in the area where the cooks operate, chilled air can be supplied at a temperature as low as 52 deg F so that the section is maintained at about 80 deg.

The air handling system is divided into two units—one unit serves the private dining room which is used during the dinner hour and on special occasions, and the other system serves the center dining room and the front dining room; conditioned air is also supplied to the



Cooled air provides comfortable working conditions to the service area.



Four Worthington compressor units, part of a two-circuit arrangement, air conditions this restaurant.

service area and the short order cooking section.

The ventilation system is divided into four sections to serve the following areas: Service and short order area, dishwashing, back kitchen and bake shop.

The short order cooks are sandwiched between the steam tables and the short order broilers, charcoal broilers and fryers. The heat given off by these cooking units is so intense that it is necessary to bring in chilled supply air, as mentioned, in order to maintain comfortable working conditions.

Air Supply

Now for specific data about the four zones just mentioned.

A total of 28,000 cfm conditioned air are supplied as follows, and of this amount, 8000 cfm are returned:

1. Private dining room, 4000 cfm.
2. Front dining room, 12,500 cfm.
3. Center dining room, 7500 cfm.
4. Zone in which short order cooks operate, 4000 cfm.

In the service area, the steam table counter divides the cooks' area from the waitresses. Hoods over the broilers and the cooking apparatus in the front kitchen, and hoods over the coffee urns in the service area are exhausted by a system which removes 17,000 cfm. This comes from the 20,000 cfm surplus (28,000 cfm conditioned supply air minus 8000 cfm return air). The balance or 3000 cfm is directed to the dishwashing section and the back kitchen.

Now for an analysis of the dishwashing section:

8000 cfm of filtered outside air are supplied to the dishwashing section.

9000 cfm are exhausted.

1000 cfm come from the conditioned air in the service area.

In the back kitchen are located ovens, radar range and kettles. This area is supplied with 10,000 cfm filtered outside air and the exhaust from this point is at the rate of 16,000 cfm. Therefore, it is necessary to obtain an added 6000 cfm. Of this amount, 2000 cfm come from the conditioned air in the service area and 4000 cfm are pulled in through a gravity type roof ventilator.

The bake shop is served by a straight ventilation system which supplies 20,000 cfm filtered outside air and exhausts at the same rate. In this space there is a complete air change every 25 seconds.

The service area, where the waitresses stand, is maintained at about 75 deg. Air is supplied through ceiling outlets which tie in with the front dining room and center dining room zones.

Earlier mention was made of 3000 cfm that are directed to the back kitchen and dishwashing section. Actually, 1000 cfm of this total are directed to the dishwashing section and 2000 cfm pass into the back kitchen at each end of the service counter.

Controls

The private dining room has its own controls. The other two dining areas and the service area are served by a three-zone air conditioner with thermostats in the dining rooms operating facing bypass dampers. The third zone supplies conditioned air to the service area from ceiling outlets which create an air flow across the steam tables. Each of the outlets has an independent volume control. The main zone which takes care of the short order area has a manual rheostat for controlling the air temperature.

Two Refrigeration Systems

As a guarantee against mechanical failure interfering with system operation, there are two separate and distinct refrigeration systems; two separate condenser water circuits with their respective pumps and cooling towers which operate in conjunction with two separate air handling units. The air handling units are fitted with dual refrigerant circuits and they operate with either or both of the two refrigerating systems. Each of the two refrigerant circuits has two compressors, each with 50% capacity reduction to control the system during light loads.

This installation with its two refrigeration systems and four compressors, and the four zones served by two air handling units presented a difficult control problem which was solved by two separate control systems. One control, serving each refrigeration circuit, consists of a two-program switch that operates by a floating type low voltage motor and governs the back pressure of the respective refrigerant circuit. Damper motors, operating the face and bypass dampers on the air handling units, are fitted with end switches to step in the respective refrigerant circuits as called for by the zone thermostats in the main dining room.

A five-ton air cooled package air conditioner with simple ductwork serves the office and a liquor store.

Credits

This system was designed and installed by Sam L. Hamilton, Inc., Miami Beach, Fla.

Psychrometric Analysis Shows

Limitations of All-Water Cooling

for Multi-Room Building

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Performance of all-water, fan-coil systems are analyzed. Through plots of sensible heat load and relative humidity, the author shows wherein these systems fail to come up to the standards of true air conditioning.

THIS study shows the variation in room relative humidity throughout the cooling cycle when both sensible and latent cooling functions are performed by a single coil. One of the systems which use a single coil for this dual purpose is the room fan-coil type in which chilled water is supplied to a single fan-coil unit usually located under the window in the offices or rooms of the multi-story building. There is no central supply of conditioned air.

Air conditioning is, according to the definition adopted by the American Society of Heating and Air-Conditioning Engineers, "the process of treating air so as to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space." A year-round comfort air conditioning system, therefore, should maintain throughout the year the desired temperature, an acceptable relative humidity, filter effectively the outside air introduced to the conditioned areas for odor dilution or "flushing," and should produce a uniform air motion in the space. The noise contribution by the system or equipment when operating should not exceed established criteria for the specific type of usage.

This graphic analysis will show only the variation in room relative humidity. No attempt will be made to evaluate the effect on comfort of (1) variable odor dilution rate due to outside wind pressure and stack effect, (2) variable air motion, (3) variable noise contribution due to different speeds, and (4) cleanliness of the ventilation air.

Several methods provide automatic capacity control of the fan-coil room unit. The control index is usually room dry bulb temperature (sensible load), consequently, the various analyses show the theoretical "swing" in room relative humidity as a function of room sensible load.

Wide variation in room sensible cooling load is significant when evaluating conditions which prevail throughout the 24-hr operating period. An analysis of different installations reveals that average sensible load is less than half of design sensible load, the latter being the governing factor in selecting and sizing equipment.

The rate of change in load (time) has not been incorporated in these curves; consequently, the effect of storage (lag, residual heat in walls and furniture, moisture absorption by walls, furniture, etc.) will tend to reduce the wide fluctuation in temperature and humidity indicated. It is conceivable, however, that during an 8-10 hr period, with lower than average storage effect, that the indicated conditions will be approached. The theoretical time lapse for complete saturation of air after the unit is turned off is approximately two and one-half hours, assuming constant internal latent load (two people), no infiltration, and moisture absorption by air only.

Design conditions upon which these analyses are based are as follows:

Outside dry bulb (day)	95 deg F
Outside wet bulb (day)	76 deg F
Design inside dry bulb	80 deg F
Design inside wet bulb	66.7 deg F
Ventilation	75 cfm
Supply	500 cfm
Coil by-pass factor	0.25
Internal latent heat	400 Btu per hr
Supply water	46 deg F
Room area	200 sq ft
Glass area	24 sq ft
Wall area	110 sq ft

The various types of unit controls which were considered are as follows:

Fig. 1. Automatic control of water quantity (modulating control).
Fig. 2. Manual fan control (on-off).
Fig. 3. Manual fan speed control (3-speed).
Fig. 4. Automatic fan control (on-off).
Fig. 5. Automatic water-flow control (on-off).

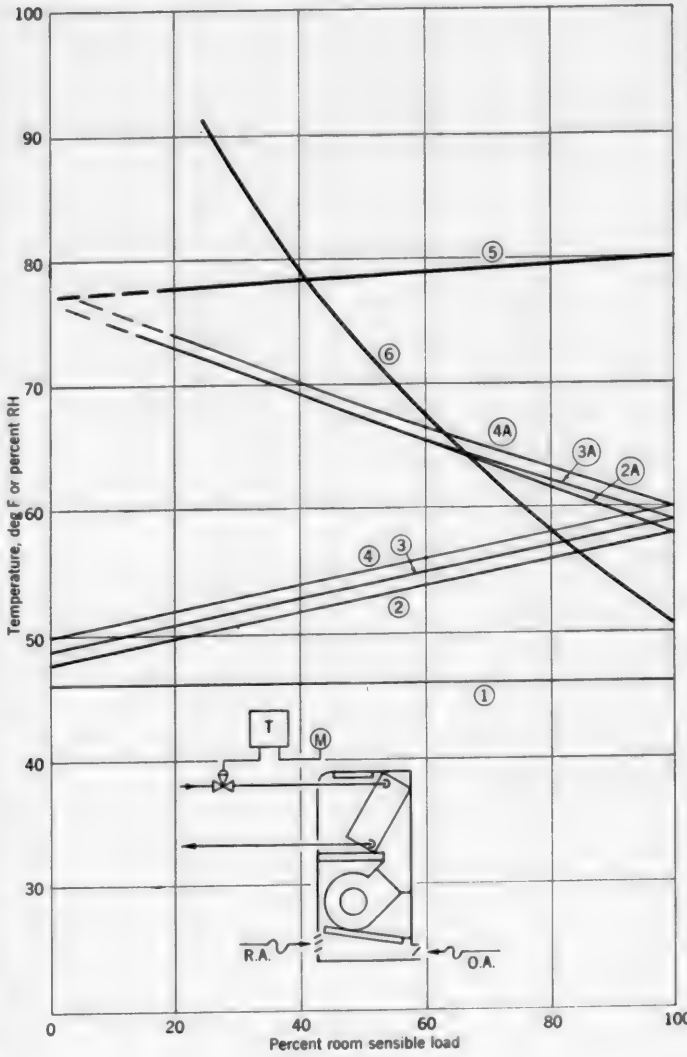


Fig. 1 (left). Room temperature and humidity conditions — fan-coil unit with automatic modulating control of water quantity.

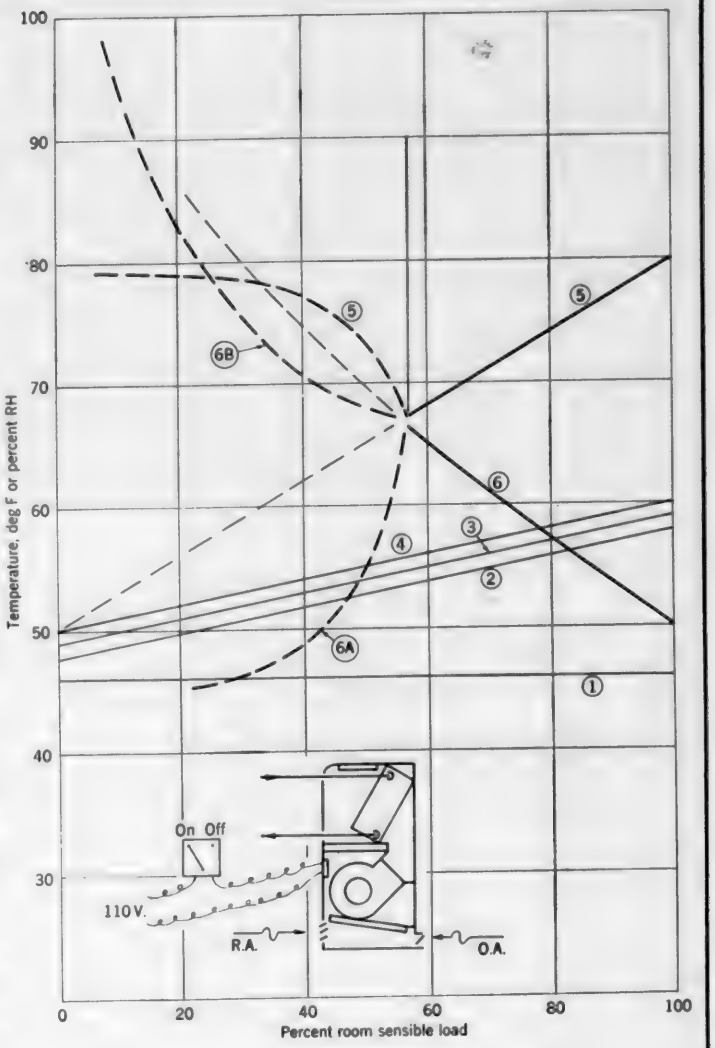
IDENTIFICATION OF CURVES

1. Temperature of entering water
2A. Coil surface temperature (ADP)
3A. Additional room latent due to coil bypass
4A. Additional room latent due to people (room dewpoint)
5. Room dry bulb
6. Room relative humidity

Fig. 2 (right). Room temperature and humidity conditions — fan-coil unit with manual, on-off fan control.

IDENTIFICATION OF CURVES

1. Temperature of entering water
2. Coil surface temperature (ADP)
3. Additional room latent due to coil bypass
4. Additional room latent due to people (room dewpoint)
5. Room dry bulb
6. Room relative humidity
6A. Room relative humidity (no internal latent, no infiltration, fan off)
6B. Room relative humidity (constant internal latent, moisture absorption by air only)



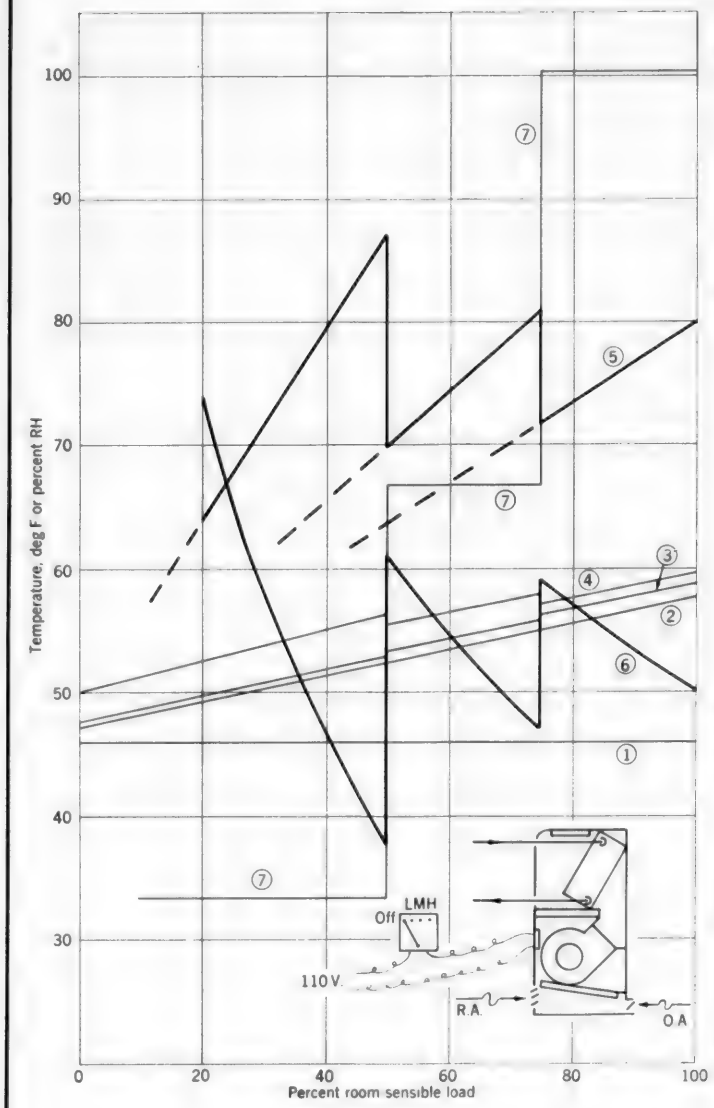


Fig. 3 (left). Room temperature and humidity conditions — fan-coil unit with manual, 3-speed fan control.

IDENTIFICATION OF CURVES

1. Temperature of entering water
2. Coil surface temperature (ADP)
3. Additional room latent due to coil bypass
4. Additional room latent due to people (room dewpoint)
5. Room dry bulb
6. Room relative humidity
7. Percent of design CFM

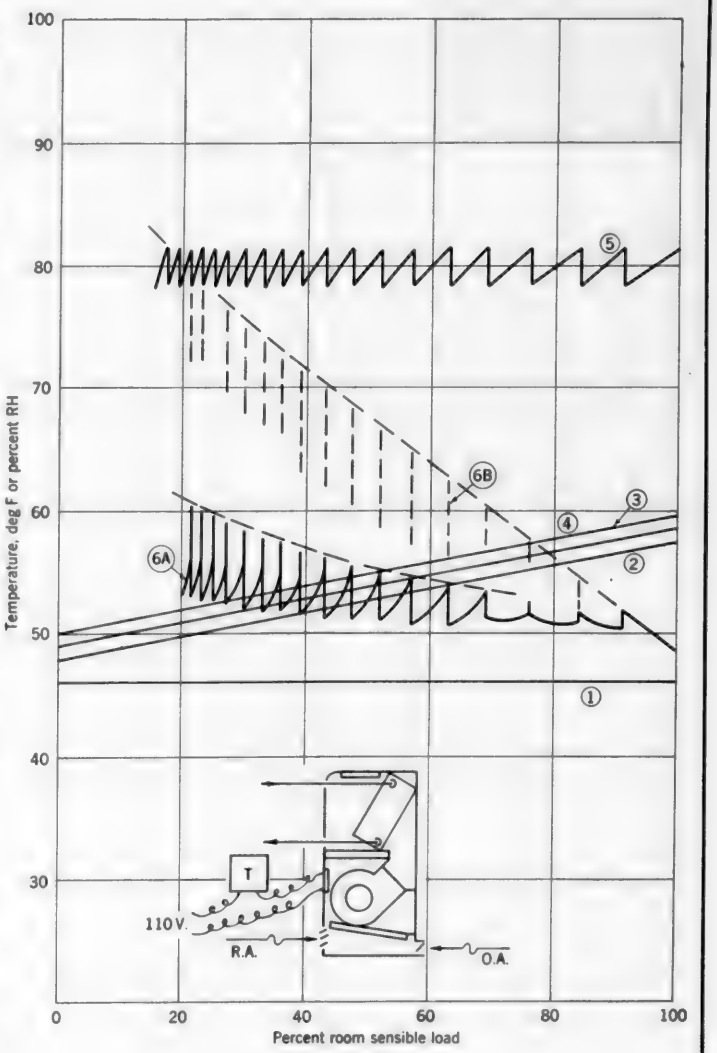


Fig. 4 (right). Room temperature and humidity conditions — fan-coil unit with automatic, on-off fan control.

IDENTIFICATION OF CURVES

1. Temperature of entering water
2. Coil surface temperature (ADP)
3. Additional room latent due to coil bypass
4. Additional room latent due to people (room dewpoint)
5. Room dry bulb

6A. Room relative humidity (constant internal latent, no infiltration)

6B. Room relative humidity (constant internal latent, infiltration, 35 cfm)

Curves shown in Fig. 1 to 5 represent the following:

Curve 1—Entering water temperature, which is assumed constant throughout the load range, and which for the specific problem is 46 deg.

Curve 2—Coil surface temperature, which for the specific unit is 57.5 deg at design load. Spread between coil surface temperature and entering water varies approximately as the grand total heat load on the coil.

Curve 3—Coil bypass effect, which for the specific unit is 25% and, with 75 cfm of outside air at 68.5 deg dewpoint (105 gr per lb) imposes an internal latent load equivalent to approximately one deg rise in room dewpoint (1.8 gr pick-up per pound of treated air).

For Fig. 1 the coil surface temperature is adjusted upward in accord with room sensible load, thus Curves *2A*, *3A* and *4A* indicate the coil surface temperature, coil bypass effect, internal latent load effect, and room dewpoint which result from modulating the water flow through the coil. The latent load becomes zero when coil surface temperature and outside air dewpoint are equal.

Curve 4 and 4A—Internal latent load (people), has been assumed constant and is equal to approximately one deg rise, (1.95 gr pick-up per pound of treated air). The spread, therefore, between coil surface temperature and room dewpoint at design is 2 deg, approximately.

Curve 5—Room dry bulb, which with thermostat having a 3-deg differential and set for 78.5 deg, will "drift" with load to maintain the slope indicated.

Maurice J. Wilson, whose 27-year business career has been with Carrier Corporation, is sales manager for the larger, packaged air conditioning units and engineered equipment for commercial and industrial application. Until recently he was product specialist for the company's Modular Weathermaster and all-air systems for multi-room buildings. He has supervised installation of year-round heating and cooling systems in prominent structures throughout the world. During World War II, he assisted the late Dr. Willis H. Carrier in engineering wind tunnels for military needs. He holds two degrees, one in mathematics from Drury College and the other in electrical engineering from Georgia Institute of Technology, and has written a number of technical papers on temperature and humidity control and on air distribution in skyscrapers.

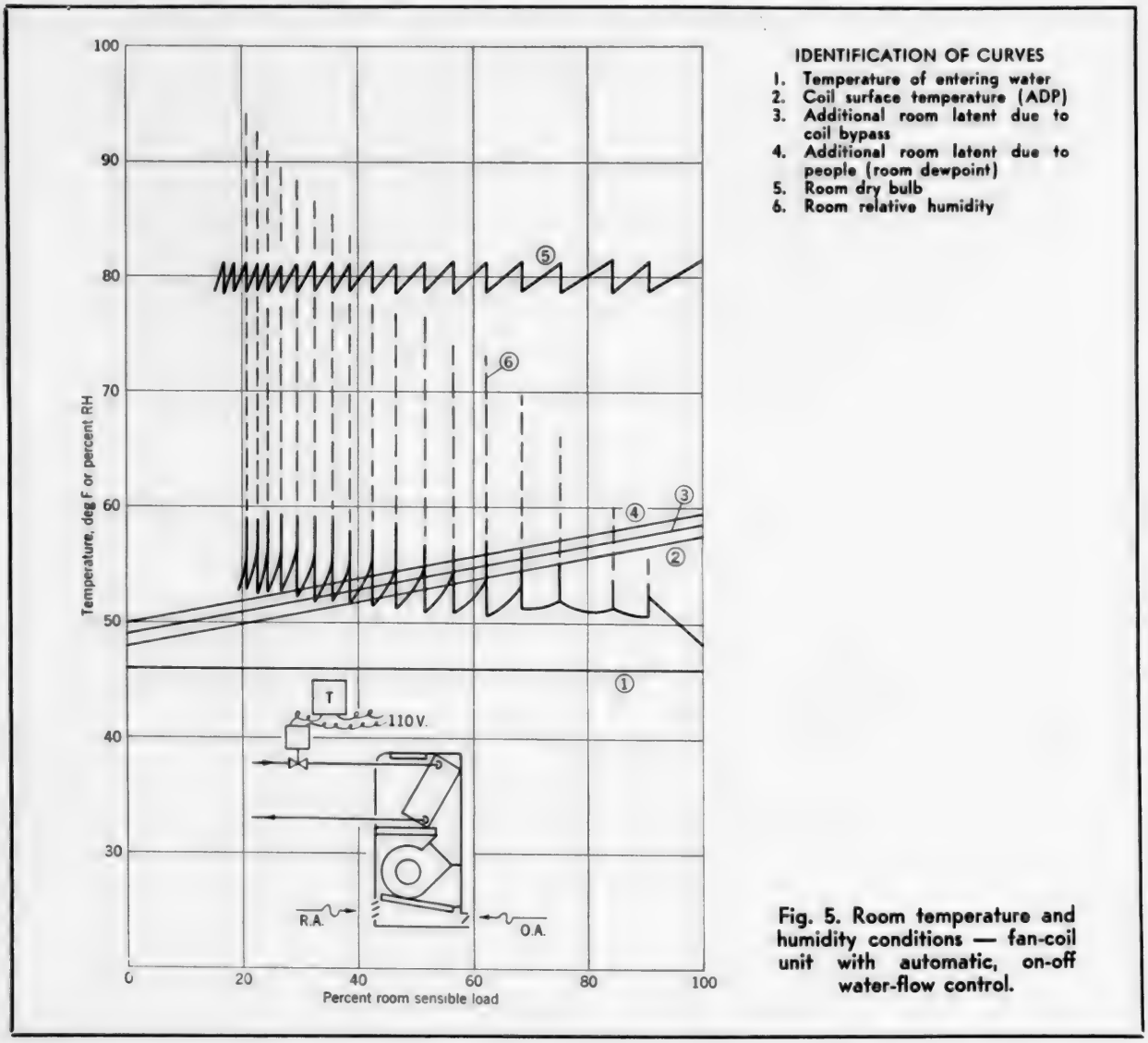


Fig. 5. Room temperature and humidity conditions — fan-coil unit with automatic, on-off water-flow control.

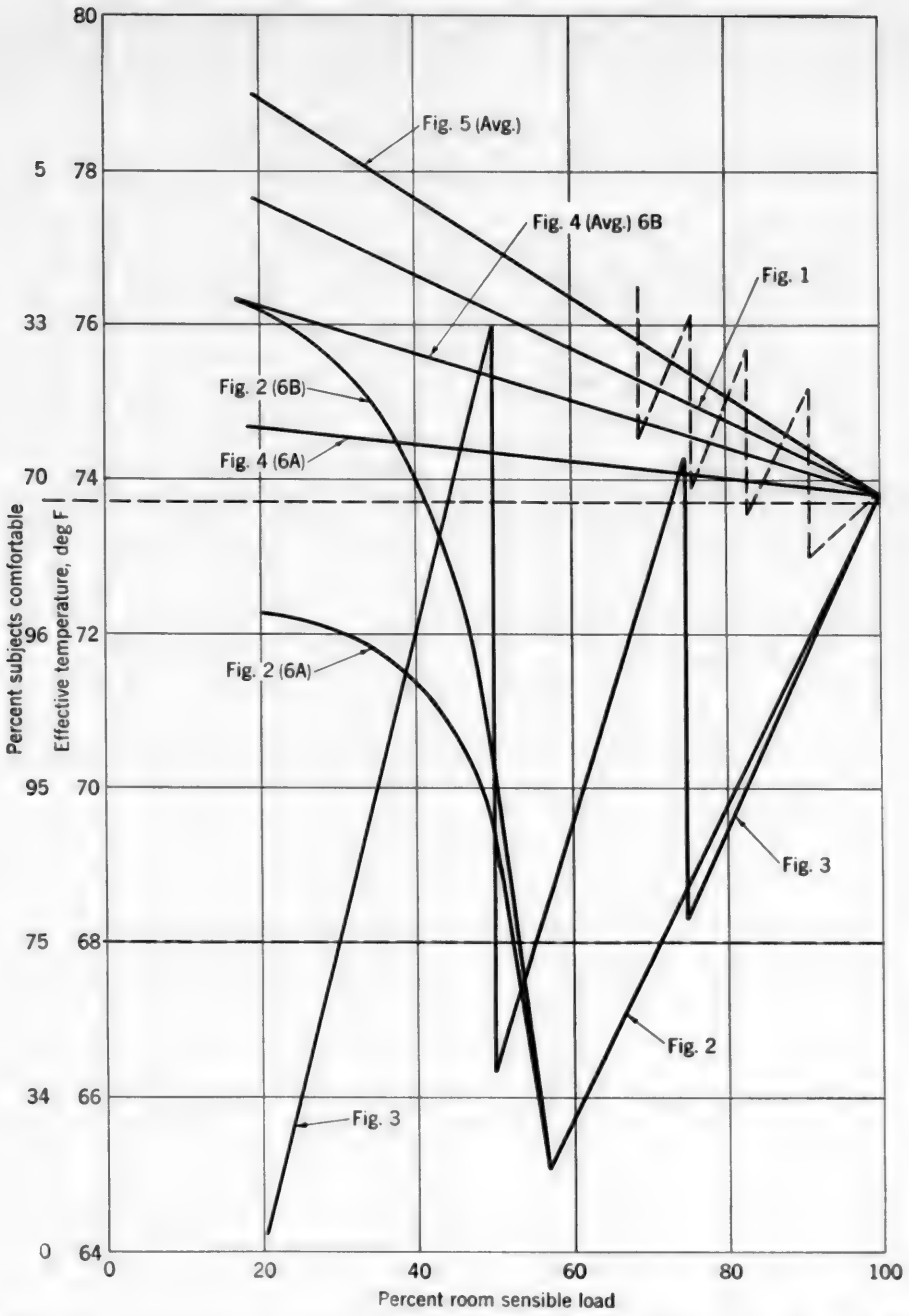


Fig. 6. Room Effective Temperatures and percentage of people comfortable with fan-coil unit controlled in the various methods charted in Fig. 1 through 5.

Curve 6—Room relative humidity, is read directly from a psychrometric chart for the coincident room dew-point and dry bulb at the various room sensible loads.

Effective Temperatures and percent comfort shown on Fig. 6 are read directly from the ASHAE *Guide* and plotted for the varying conditions which resulted with each type of unit control. The comfort band indicated in Fig. 6 (75% comfortable) has been selected arbitrarily as an allowable swing in room effective temperature.

With each type of control, humidity remains uncontrolled and it is seen that Effective Temperatures vary widely. Conclusions, therefore are:

1. Sensible and latent cooling capacity when performed by a single element, cannot be adjusted to the wide range of coil sensible heat ratios which occur in comfort cooling. In other words, maintenance within acceptable limits of room relative humidity is sacrificed in order to provide desired dry bulb temperature.

2. Variable ventilation rate, air movement and noise could effect to an objectionable degree our sensation of comfort.

3. Air conditioning means the simultaneous control within acceptable limits of these various factors which affect our comfort. Therefore, such systems should perhaps be identified as heating and cooling systems.

Centrifugal Pump Troubles

IGOR J. KARASSIK and ROY CARTER
Harrison Division, Worthington Corp.

This is Part I of a two part article which includes check lists of common pump troubles and possible causes. Emphasis is directed to the most important trouble spots, along with information to help prevent the difficulties described.

TROUBLES that affect the operation of a centrifugal pump may be either of a hydraulic or of a mechanical nature. In the first group, a pump may fail to deliver water, it may deliver an insufficient capacity or develop insufficient pressure, it may lose its prime after starting, or consume excessive power. Symptoms of mechanical difficulties may show up at the stuffing boxes, at the bearings or in the vibration, noise or overheating of the centrifugal pump.

At the same time, it is important to note that there exists a definite interdependence between some difficulties of both classifications. For instance, increased wear at the running clearances must be classified as a mechanical trouble, but will result in a reduction of the net pump capacity—a hydraulic symptom—without necessarily causing a mechanical breakdown or even, let us say, excessive vibration. As a result, it may be of great advantage to classify symptoms and causes separately and to list for each symptom a schedule of potential contributory causes. Such a tabulation is presented in Tables 1 and 2.

In practically all cases, the cure for each cause of trouble is self-evident and the remainder of this article will be devoted to the analysis of some of the most important trouble spots, an analysis which may be further helpful in diagnosing and, in some cases, preventing these troubles.

TABLE I—SYMPTOMS AND CAUSE OF TROUBLE

SYMPTOM	POSSIBLE CAUSES
Pump does not deliver water	1-2-3-4-6-11-14-16-17-22-23
Insufficient capacity delivered	2-3-4-5-6-7-8-9-10-11-14-17-20-22-23-29-30-31
Insufficient pressure developed	5-14-16-17-20-22-29-30-31
Pump loses prime after starting	2-3-5-6-7-8-11-12-13
Pump requires excessive power	15-16-17-18-19-20-23-24-26-27-29-33-34-37
Stuffing box leaks excessively	13-24-26-32-33-34-35-36-38-39-40
Packing has short life	12-13-24-26-28-32-33-34-35-36-37-38-39-40
Pump vibrates or is noisy	2-3-4-9-10-11-21-23-24-25-26-27-28-30-35-36-41-42-43-44-45-46-47
Bearings have short life	24-26-27-28-35-36-41-42-43-44-45-46-47
Pump overheats and seizes	1-4-21-22-24-27-28-35-36-41

Pump Noises

The subject of pump noise is one that is receiving considerable attention, and rightly so, in the selection and application of centrifugal pumping equipment in the air conditioning, heating and ventilating field. It has also been given special attention in the research programs of a number of centrifugal pump manufacturers, with the result that important advances have been made in the understanding of the manner in which noise originates and is propagated. This better understanding has, in turn, led to considerable improvement of current installations. A complete discussion of the subject of pump noise would be difficult to fit into this group of articles, and the reader is referred to two excellent treatises on the matter.* It might, at the same time, be interesting to list a few considerations which would help clarify the readers' thoughts on this subject:**

1. Hydraulic noise can be due to poor matching of the pump to the conditions of service. If the conditions are best met at a speed of 3600 rpm, there will be less hydraulic noise at that speed than at 1800 rpm. The converse, of course, is also true.

2. Hydraulic noises can likewise be the result of abnormal operation or incorrect application, since they come from:

a. Churning, (operation at too little or no flow).

*How to Control Centrifugal Pump Noise by L. M. Evans, Worthington Corp., publication RP-894.
Noise Reduction in Pumps and Pump Systems, by Norman L. Meyerson, Worthington publication RP-934, reprinted from *Noise Control*, March, 1957.

**The following seven considerations are quoted from an article by Karassik and Carter in *Air Conditioning, Heating and Ventilating*, June, 1954.

b. Instability (operation at too much capacity or too low a head).

c. Cavitation, (operation with too low a net positive suction head).

3. Extremely high fluid velocities in pipes rigidly tied to building structures can produce a noise that may be unjustly attributed to the pump. Care should be exercised in the sizing of piping to give reasonably low velocities as well as adequate support.

4. Motor noises come principally from the fan and the bearings. Fan noise can be reduced to a remarkable degree by the proper design and location of the fan. For instance, where a large fan may have been used to provide more air movement through the motor, it has been frequently found that a smaller fan with a change in baffling will provide satisfactory cooling and lower the noise level appreciably. While bearing whirr is slightly more noticeable at higher speeds than at lower, proper bearing design can make this difference negligible.

5. Noise can originate from vibration of a pump or its driver. A well designed unit, with proper alignment, will produce very little, if any, vibration.

6. Precautions should always be taken to limit transmission of noise by providing insulated mounting and insulation of the piping attachments.

7. A pump need not be quiet but only less noisy than the surrounding noise level. Usually, a sound level of 80 to 85 decibels will be acceptable if precautions are taken to limit noise transmission and if the unit is not located at a place where people congregate.

Noise Due to Cavitation

Pump noise will very frequently give a definite indication as to the source of trouble to an experienced maintenance man. If a pump produces a crackling noise, it is most likely that the source of trouble will be found at the pump suction. This type of noise is generally associated with cavitation. This term describes, in general, conditions which exist in flowing liquid whenever the pressure at any point falls below the vapor pressure of the liquid at the prevailing temperature. Some of the liquid flashes into vapor and bubbles of the vapor are carried along with the remaining liquid. Whenever this happens in the suction area of a centrifugal pump or within the entrance of the impeller, the bubbles, on proceeding further into the impeller, undergo an increase in pressure and re-condense. This process is accompanied by a violent collapse of the bubbles, possible pitting and erosion of the impeller vanes and a definite crackling noise. Of course, the presence of vapor within the liquid pumped causes a reduction in the pump capacity. Cavitation, therefore, is a direct result of insufficient pressure at the pump suction, in other words of operation with insufficient NPSH (net positive suction head). It is possible to check whether the diagnosis is correct.

For instance, throttling the pump discharge will reduce pump capacity and possibly restore pump operation back into a range where sufficient NPSH is available at the pump suction. Should this eliminate the crackling noise, the diagnosis is correct and, of course, steps to eliminate the trouble are self-evident. They will consist of either increasing the NPSH for the normal range of operating capacities, or of replacing the existing impeller with one which can operate with the prevailing NPSH if the latter cannot be altered.

TABLE 2—LIST OF TROUBLE CAUSES

Numbers refer to Table I
POSSIBLE CAUSES OF TROUBLE

SUCTION TROUBLES

1.—Pump not primed
2.—Pump or suction pipe not completely filled with liquid
3.—Suction lift too high
4.—Insufficient margin between suction pressure and vapor pressure
5.—Excessive amount of air or gas in liquid
6.—Air pocket in suction line
7.—Air leakage into suction line
8.—Air leakage into pump through stuffing boxes
9.—Foot valve too small
10.—Foot valve partially clogged
11.—Inlet of suction pipe insufficiently submerged
12.—Water seal pipe plugged
13.—Seal cage improperly located in stuffing box, preventing sealing fluid entering space to form the seal

SYSTEM TROUBLES

14.—Speed too low
15.—Speed too high
16.—Wrong direction of rotation
17.—Total head of system higher than design head of pump
18.—Total head of system lower than pump design head
19.—Specific gravity of liquid different than design
20.—Viscosity of liquid differs from that for which designed
21.—Operation at very low capacity
22.—Parallel operation of pumps unsuitable for such operation

MECHANICAL TROUBLES

23.—Foreign matter in impeller
24.—Misalignment
25.—Foundations not rigid
26.—Shaft bent
27.—Rotating part rubbing on stationary part
28.—Bearings worn
29.—Wearing rings worn
30.—Impeller damaged
31.—Casing gasket defective, permitting internal leakage
32.—Shaft or shaft sleeves worn or scored at the packing
33.—Packing improperly installed
34.—Incorrect type of packing for operating conditions
35.—Shaft running off center due to worn bearings or misalignment
36.—Rotor out of balance resulting in vibration
37.—Gland too tight resulting in no flow of liquid to lubricate packing
38.—Failure to provide cooling liquid to water cooled stuffing boxes
39.—Excessive clearance at bottom of stuffing box between shaft and casing, causing packing to be forced into pump interior
40.—Dirt or grit in sealing liquid, leading to scoring of shaft or shaft sleeve
41.—Excessive thrust caused by a mechanical failure inside the pump or by the failure of the hydraulic balancing device, if any
42.—Excessive amount of grease or oil in the housing of an anti-friction bearing or lack of cooling, causing excessive bearing temperature
43.—Lack of lubrication
44.—Improper installation of anti-friction bearings (damage during assembly, incorrect assemby of stacked bearings, use of unmatched bearings as a pair, etc.)
45.—Dirt getting into bearings
46.—Rusting of bearings due to water getting into housing
47.—Excessive cooling of water-cooled bearing resulting in condensation in the bearing housing of moisture from the atmosphere

A rumbling noise is generally caused by conditions in the discharge waterways of the casing, either because of operation at part load capacities when the pump is not hydraulically suitable for such operation or because the pump operates at capacities well in excess of those for which it was designed.

Water Hammer

Water hammer is caused by a sudden change in the velocity of flow of a column of liquid and usually is only of a serious nature when long pipe lines are involved. It

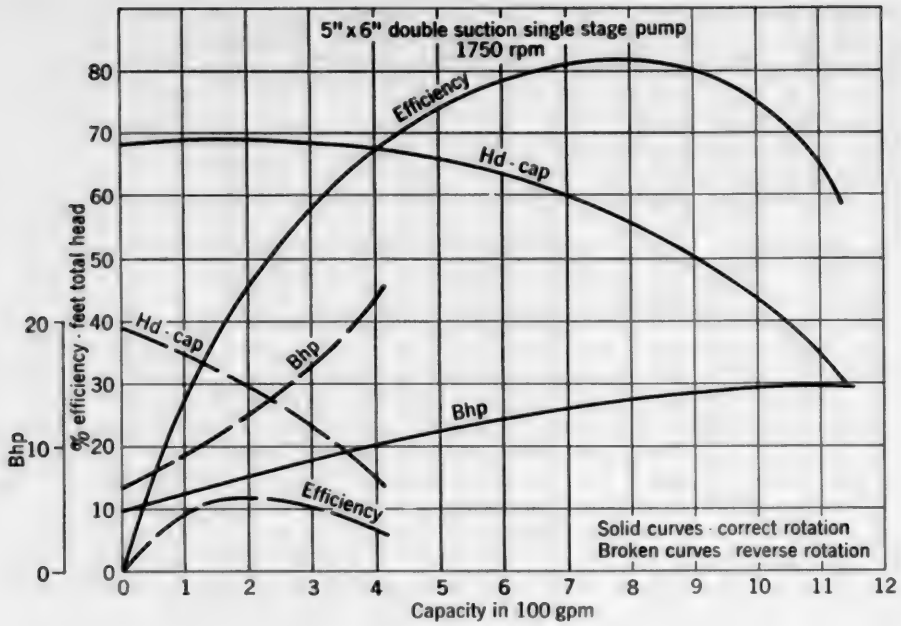


Fig. 1. Effect of incorrect rotation on pump performance is seen by comparing broken curves for reverse rotation with solid curves for correct rotation.

can be avoided by starting a pump against a closed gate valve and by opening the valve slowly after the pump is started thus causing a very gradual increase in the velocity in the pipe line. During the stopping cycle, it is necessary to shut the gate valve slowly and stop the pump after the valve has been fully closed. This method fails when a unit or units may be stopped suddenly by a control or power failure so that additional provisions to control water hammer must be provided in installations where the resulting pressure due to water hammer can reach a dangerous magnitude.

In such installations, slow opening and closing check valves are generally employed so that, in starting, the flow is gradually increased and in stopping a reverse flow results and is gradually stopped. In other cases, a special protective valve is employed.

This valve is a type which opens wide quickly with the drop of pressure which is part of a water hammer cycle and then closes slowly to throttle the resulting back flow. In some cases, air charged surge tanks or air chambers have been used satisfactorily. As the time required for a motor driven pump to stop delivering water after the power is cut off is almost instantaneous, water hammer can be a more serious problem with that type of installation than it would be if the pump stopped slowly. In a few very important high head installations, the stopping time has been lengthened to ease the situation by adding a flywheel to the unit. While the actual time before the unit stopped pumping is lengthened very little, this slower stopping cycle helps greatly in minimizing the water hammer.

Air Leakage into a Pump

When a pump operates with a suction lift, air will sometimes get into the pump through the stuffing boxes, unless lantern rings are installed in these boxes and liquid under positive pressure is piped to the lantern rings. Another possibility, of course, is air leakage under the shaft sleeves. Sometimes, the suction piping itself is not quite air-tight and air enters into it, collecting at the top of the casing. At other times, the water handled by the pump is saturated with air and this air may go out of solution in the pump.

If a limited amount of air is allowed to leak into the suction side of a centrifugal pump, the air will be carried through the pump. This ability of a centrifugal pump to carry a small amount of air through its passages is utilized in some installations involving a pneumatic tank to add air into the tank. Naturally, if air leaks into the suction passages and passes through the pump, there is a reduction in the amount of water handled and power required. If the amount of air allowed to leak into the suction side is increased, a point is reached at which the pump will be unable to carry the air through with the water and the pump will lose its prime.

Sometimes a pump which operates satisfactorily under full discharge will lose its suction when throttled to a lower rate of flow.

Such a condition may be caused by the presence of air leakage into the pump. At full discharge capacity, the velocities in the pump casing are sufficiently high to wash the air into the discharge pipe, thus constantly purging the air from the pump casing. As the capacity is reduced, the lower velocities are insufficient to wash out the air which accumulates in the top of the casing until it prevents further pumping action and the pump loses its prime.

In other cases, a pump will deliver its normal rated capacity when it is started but soon after its delivered capacity will start to decrease gradually, until it handles but a fraction of its normal flow. The behavior of such a pump indicates an air leak. Air is accumulating at the top of the casing, reducing the effective capacity of the pump. It is possible to check the accuracy of this diagnosis by opening the casing vent to atmosphere and finding whether the pump capacity is restored after this operation.

Some noisy pumps operating with a suction lift can be quieted by allowing a small leakage of air into the suction. This is not considered good practice. The admission of air quiets the pump in such a case merely be-

cause the pump is operating with an excessive suction lift and the air cushions the cavitation phenomena. The amount of air necessary varies with the capacity and a variation in capacity due to variation in operating head will require a different amount of air. Furthermore, the presence of air will generally have an adverse effect on the efficiency of the pump and may accelerate corrosion in some cases. In addition, the presence of air in the water pumped is frequently undesirable. The fact that a small amount of air leaking into the suction line will quiet certain noisy pumps should be used as a test that the cause of the noise is on the suction side. It is not a remedy.

System Troubles

Some of the troubles which fall into this category are relatively easy to correct. For instance, should the motor leads be improperly connected, the pump will rotate in the wrong direction and as soon as this condition is diagnosed, the motor leads may be reversed and the installation ready for proper operation. When a centrifugal pump is operated in a reverse direction, its performance characteristic is wholly different from the normal and is highly inefficient. The effect of reverse operation is illustrated in Fig. 1 for a typical design.

The motor of a newly installed pump should be tested for correct rotation with the motor disconnected from the pump. This is particularly important for vertical turbine pumps and for other pumps employing shafting sections joined by screwed couplings. With this type of shafting, incorrect rotation, even for testing, would result in one or more couplings becoming unscrewed and would require drawing the pump out to reconnect the joint or might even result in damage to some of the pump parts.

Occasionally, the non-return or check valve, used to prevent reverse flow through a pump when the unit is shut down, fails to function and remains open. If this occurs, there takes place a back flow of water through the pump, the latter becomes a water turbine and, if the driver does not act as a brake, the unit rotates in the reverse direction at the runaway speed of the pump acting as a water turbine. This runaway speed depends on two factors: the type of the pump and the net head available. With an effective net head equal to the design pumping head, the runaway speed varies from a maximum of approximately 175% of rated speed with low head, high specific speed types of propeller pumps to even less than rated speed for high head, low specific speed types.

Most pumping systems involve both a static and frictional component. Thus, when reverse flow occurs, the net head, which is now the static head less a friction head, is usually considerably less than the normal pumping head which was static plus friction. This lower net head available at the time of reverse flow causes the resulting runaway speed to have a lower value than would result with a net head under reverse flow equal to the design head.

Too low or too high an operating speed can generally be the cause of faulty operation only in the case of a turbine or engine driven unit and while the process of correcting this trouble may be in some cases more involved than the correction of wrong direction of rotation for a motor, it is not too difficult of execution. It remains necessary to remember, however, that if the pump driver is subject to speed variation, the first step in diagnosing variation of operating conditions from their expected value is to determine the operating speed and check whether it corresponds to the design.

The problem of parallel operation of centrifugal pumps is one which causes difficulties in some cases. If it is attempted to operate centrifugal pumps which, by virture of their characteristics, are unsuitable for parallel operation, the choice of corrective measures is not too attractive. In some conditions, it may be found that as long as parallel operation is restricted to the higher capacity range of the various pumps, no difficulties arise. It becomes necessary in such cases to maintain only such a number of pumps on the line which will insure their individual operation in this higher range of capacities. If high head pumps are involved and, especially, if these pumps handle liquid at or near its boiling point, it is absolutely essential that the protective recirculation bypass lines remain open at all times in order that an unforseen reduction in total capacity does not result in the slamming of a check valve on one of the pumps with the consequent burning up of the unit.

A second solution consists of manual control of all the units, a procedure both tedious and uneconomical in its wastage of manpower. The third and last solution, of course, consists in the revamping of the pumps in question and replacement of the hydraulic element with parts which will correct the shape of the characteristic curves so that parallel operation becomes feasible.

A break in the discharge line of a centrifugal pump cannot be considered a very frequent source of trouble. If the discharge line break occurs near the pump, the latter will operate against a very low head and, as a result, will deliver nearly its maximum capacity. With some installations, this will result in a dangerous overload on the driver. Should the break occur at some distance from the pump, a larger frictional component may be involved—especially if the static portion of the total head is low—and the capacity will be limited to a smaller value.

The next article will take up the various sources of mechanical troubles which can disrupt the satisfactory operation of a centrifugal pump installation.

Pump Series Being Concluded

This article on Centrifugal Pump Troubles, which will be concluded next month, is the final article in a series by Igor J. Karassik and Roy Carter. The authors, specialists in centrifugal pumps, are Worthington Corporation engineers. These articles covered various phases of centrifugal pump design, installation, operation and maintenance. The first article appeared in the July, 1958 issue of AIR CONDITIONING, HEATING AND VENTILATING. Parts of this group of articles were published each month after that date.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Draining Watertight Floor Slabs

EVERY now and then an engineer will encounter a problem in the design of plumbing facilities for a building where it is necessary to locate plumbing fixtures or equipment over floor areas below which there must be no danger of water seepage through the floor slab on which the fixtures or equipment are located. The space below this slab may be an area where important electrical or other type apparatus is installed. Or this area may be a finished lobby, recreation room, display area, or storage room. When this condition is prevalent, the engineer must take the necessary steps to prevent the occurance of water seepage.

Normally the architect will locate the rooms or areas which include water and waste facilities in such a manner that they will not be placed directly over the type of spaces previously mentioned. However, sometimes it is not possible to locate the rooms so that they will not be over critical areas. It is then required that some consideration be given to methods that may be employed so that water will not seep through the floor slab above the rooms noted.

Take, for example, a rest room, kitchen, utility room, heating or air conditioning equipment space, or any other type room or area where water and waste facilities are included. When such rooms and spaces are included over critical areas, it is imperative that the floor slab be waterproofed.

Many methods may be used to waterproof the slab. The decision as to which method should be used rests with the architect and the structural engineer. Regardless of the specific method used, lead or copper flashing is used in most cases to assure a watertight condition. The sheet lead or copper material is formed to the shape of the room or area and extends up at least 6 to 8 inches at the sides to prevent seepage. A typical watertight pan is shown in Fig. 1. When copper is used, the copper sheets are soldered together to form the required pan. When lead is used, strips of sheet lead are joined together to form the desired shape of pan. The particular weight of material is given in ounces for copper and in pounds for sheet lead. The engineer will decide the weight of material to be used, based upon his specific needs.

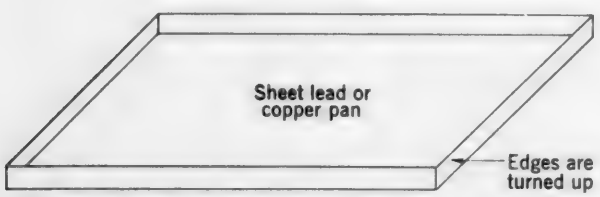


Fig. 1. Sheet lead or copper watertight pan fabricated at the job site.

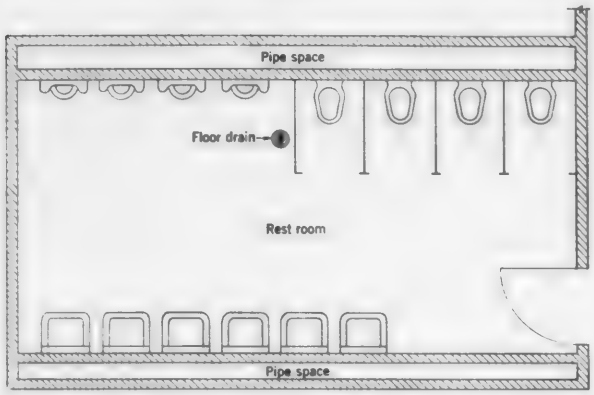


Fig. 2. Location of fixtures and floor drain in a typical rest room.

Typical Application

While the watertight pan will prevent any seepage of water through the concrete slab, provision must be made to intercept any water that may be discharged on the floor level. For a typical application refer to Fig. 2 which shows a general rest room layout. Fixtures that might be included are water closets, urinals and lavatories. You will note that a floor drain has been included in the rest room to intercept any water that may be discharged on the floor due to an overflowing fixture.

The specific location of the floor drain is only a suggestion, for it can be placed in any spot that seems to be most practical. It has been placed in this particular location so (1) it will not appear too obvious in the finished room and (2) it will be in line with and close to the vertical soil stack to which it is to be connected.

Typical Elevation of Rest Room

A typical elevation of the rest room is shown in Fig. 3. The watertight pan is shown in place.

In the installation illustrated, the watertight pan is fabricated on top of the rough floor slab. Above this is placed a layer of lightweight concrete, cinders or any other type of particular fill material that might be favored by the architect or structural engineer. On top of the fill, a layer of concrete is placed for the setting of the tiled floor.

The sides of the watertight pan are turned up at the

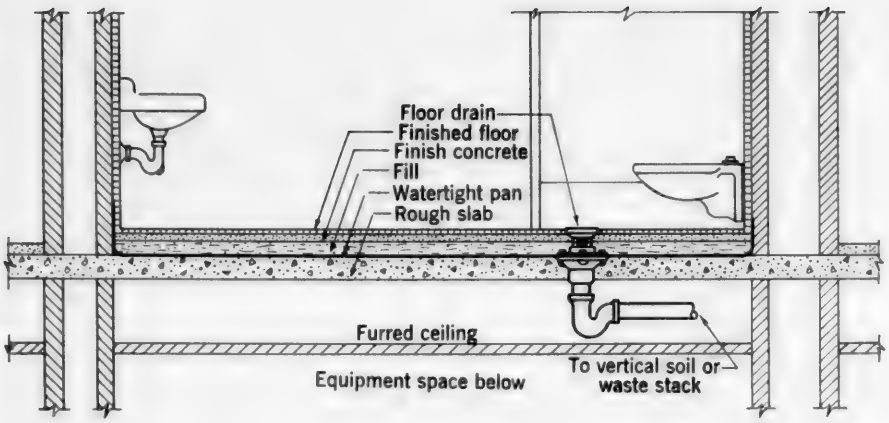


Fig. 3. Elevation of a rest room and the arrangement for a floor drain.

edges of the room as indicated to prevent any possibility of water seeping through the floor at the sides of the room.

The plumbing fixtures, including water closets, urinals and lavatories, are the off-the-floor type to avoid any floor penetration by the roughing of the fixtures. There are no special provisions for the pipe spaces since these generally extend down to the basement of the building and therefore present no hazard. If the lavatories cannot be located as shown, then they should be located on the same wall with the water closets and urinals.

The floor drain illustrated serves a dual purpose by intercepting spillage at the floor surface and in addition, intercepts seepage that may accumulate at the level of the watertight pan. The drain clamps to the watertight pan to offer a leakproof connection. Weep holes in the drain take care of the seepage at the level of the watertight pan.

The drain trap has been installed in the furred ceiling of the floor below. If entry to the trap is required for cleanout purposes, an access door must be provided in the ceiling of the floor below. If venting is required, it must be accomplished in the furred ceiling, in a manner prescribed by the local plumbing code.

Typical Floor Drain

Figure 4 is an enlarged detail of the floor drain shown in Fig. 3.

The drain body itself is contained in the rough floor slab. A clamping arrangement secures the lead or copper pan to the drain. Weep holes in the clamping collar drain any seepage that may accumulate on the watertight pan. It is rather difficult for water to seep through the tiled floor. Nevertheless, drainage must be provided and the weep holes in the clamping collar serve this function in the event that water does accumulate in the pan. The strainer shank is adjusted so that the top of the strainer will be level with the surface of the floor and thus intercept any water that overflows out of the fixtures. It is important to mention here that the floor surface should be sloped toward the floor drain for positive drainage results.

Kitchens and Equipment Rooms

Figure 5 shows a type of drain that is recommended for kitchens or equipment rooms that are located above critical areas where leaks can be quite destructive.

The floor drain illustrated in Fig. 5 is the same type shown in Fig. 4, with the exception that a funnel has been incorporated in the grate of the drain. This funnel has a definite advantage in kitchens where much of the waste facilities is of the indirect type from some of the kitchen equipment. This type drain serves a triple purpose. It can be used as a funnel drain for the indirect

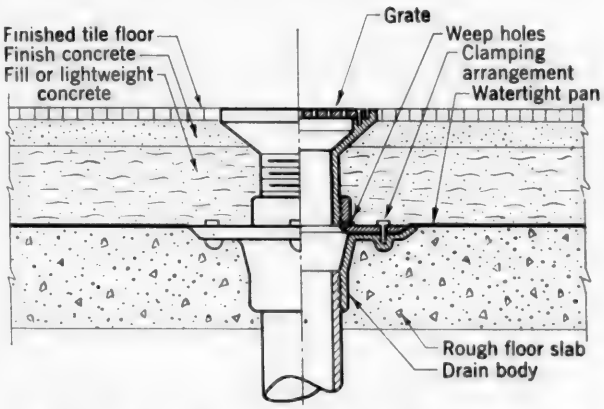


Fig. 4. Floor drain with provisions for intercepting seepage at the watertight pan.

waste lines and also serves as a floor drain since the floor surface water will be intercepted by the grate. The clamping arrangement is equipped with weep holes that will intercept water that has accumulated at the watertight pan.

This particular drain is also ideal for spaces that house

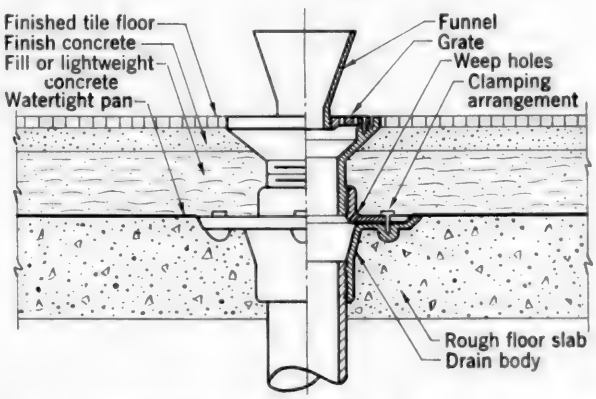


Fig. 5. Arrangement of a floor drain that also serves as a funnel drain.

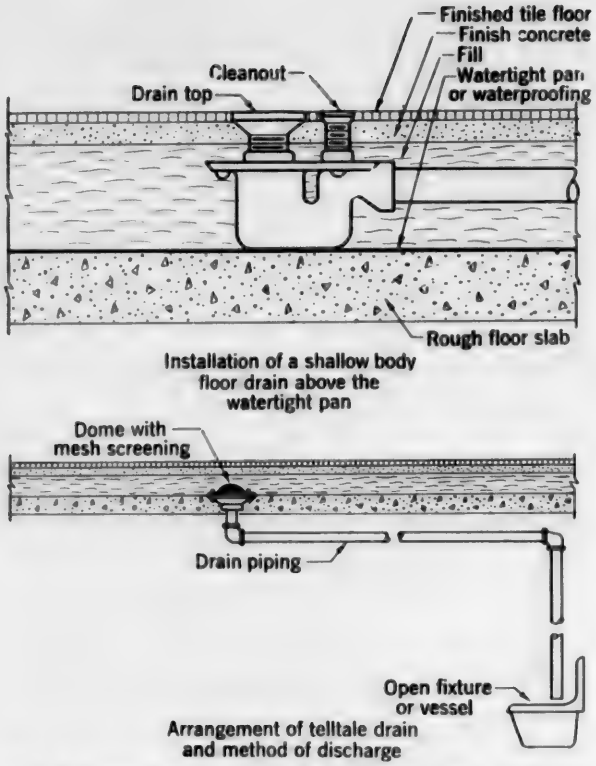


Fig. 6. Manner in which a shallow body floor drain can be installed.

heating or air conditioning equipment because the funnel serves as an indirect waste to handle the drip piping from the various items of equipment. In addition, the drain can be used for other types of equipment or apparatus where water and waste lines are utilized.

Above Slab Installation

All the drain installations described have had the waste piping from the floor drain included in the furred ceiling space. Sometimes it becomes necessary to install the piping above the rough floor slab. When this condition exists, the installation can be made as suggested in Fig. 6.

Here a drain with shallow physical dimensions is used to enable it to fit tight space requirements. The drain is placed on top of the watertight pan and the waste piping is run in the fill to the point where it connects with the vertical soil or waste stack. This type drain does not offer any provision for intercepting water that may accumulate on the watertight pan, therefore, a separate telltale drain must be installed as indicated. The small drain consists of a drain body, a clamping collar, and a small dome that is covered with copper or plastic

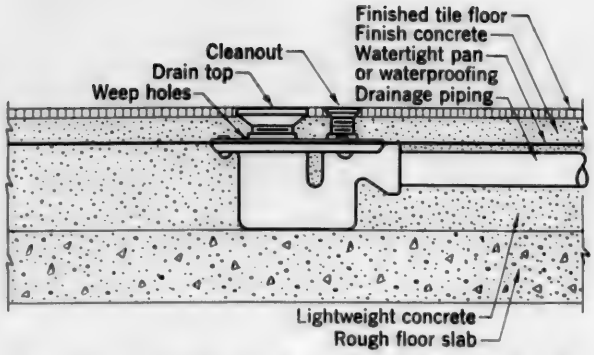


Fig. 7. How a shallow body floor drain can be installed with its clamping arrangement engaging a watertight pan or waterproofing material.

mesh. This type arrangement is used where a number of drains are required for equipment or apparatus in an area, and the drain piping, by virtue of the nature of the construction, is to be contained above the floor slab.

The shallow body floor drains are equipped with a grate and a cleanout that is level with the floor area. The cleanout provides access to the waste piping in the event of a stoppage. The telltale drain is placed in an out of the way location, at the ceiling below, so that it will not be too obvious. The waste piping of the telltale drain usually is discharged into the nearest fixture, most generally a service sink at the floor level below. The purpose of the mesh screening around the dome of the telltale drain is to prevent the fill from entering the waste piping from this drain.

In connecting with the vertical soil or waste stack, the waste piping from the floor drain must pass through the edge of the watertight pan. This penetration must be done carefully to avoid any possibility of leakage. To make a proper seal, bitumastic or other type of compound or cement is applied to the point of penetration around the piping.

Alternate Method

Another method for installing this type drain is shown in Fig. 7. In this instance, the watertight pan or waterproofing is placed above the fill as shown. The clamping collar arrangement engages the pan or waterproofing to provide a tight connection. Weep holes in the clamping collar intercept any seepage that may accumulate at the level of the pan or waterproofing.

When required, a funnel may be placed in the grate to serve indirect waste or drip lines from fixtures and equipment.

When venting is required it must be installed in the fill in a manner that conforms to the applicable local code regulations.

If you are a regular reader of Mr. Blendermann's monthly department, you will be interested in the publication of his articles in a new book, DESIGN OF PLUMBING AND DRAINAGE SYSTEMS. This book contains just the kind of information you look forward to every month from Mr. Blendermann — practical facts, figures, design data . . . the thorough discussion of basic, specialized and unusual plumbing and piping problems. 328 pages, 201 illustrations, $7.00. See next month's AIR CONDITIONING, HEATING AND VENTILATING for further details . . . or send for it today under 5-day free-inspection plan. THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

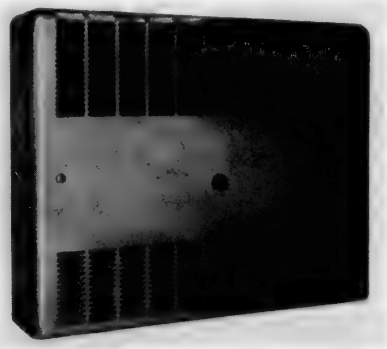
NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Fan-Coil Heater-Cooler

CHC Cooling-Heating Conditioners, manufactured in two sizes, models CHC-150 and CHC-300, are offered by Dunham-Bush, Inc., West Hartford, Conn.

These units are especially designed to meet the smaller space and capacity requirements of hotels, motels, apartments and residences. Together with the company's water chillers, pumps, and cooling towers, all necessary equipment to meet complete system specifications are provided.



Designed basically for free standing use, but readily adaptable for semi-recessed, between the stud, applications, these standard units can be wall mounted, fully exposed, or semi-recessed, as required for off-the-floor installations. Matching trim pieces are available for finishing purposes on semi-recessed applications.

Fresh air wall boxes are available to meet ventilation requirements calling for the introduction of fresh air up to 20% of rated CFM. Standard features include: Insulation on all inside cabinet surfaces, 115-1-60 motor with built-in overload protection, factory installed 3-speed fan control switch, and throwaway filter.

More information? Circle Item 1, postcard, last page.

Heavy End Aluminum Pipe

Heavy end aluminum pipe, said to be the first ever offered by the American aluminum industry, was announced by Reynolds Metals Company, Louisville, Ky. Available immediately, it is produced through a new extrusion process developed by the company.

Heavy end pipe offers increased strength and thickness at pipe ends where welded or threaded joints are made, while actually utilizing less metal in the pipe body, the company states. By putting metal where it is needed for strength in the joints, and eliminating excess thickness in the pipe body, the company offers users operating pressures equivalent to standard pipe with cost savings ranging by pipe size up to 27%.

According to the manufacturer, the new pipe, being lighter than the conventional aluminum product, further reduces shipping and handling costs. It is presently offered in selected sizes equivalent to many standard Schedule 40 and 80 sizes. The new extrusion process, however, is flexible and can be adapted to a wide range of diameters and wall thicknesses required in individual installations.

Pipe ends are identical to those of standard pipe and are adaptable to grooving, threading, beveling for welding, and preparation for other types of mechanical fittings. Standard flanges and fittings can also be used.

More information? Circle Item 2, postcard, last page.

Add Flame-Retardant Jacket

With the addition of a new flame retardant jacket, called Pyro-Kure, to its line of pipe jacket coverings, Owens-Corning Fiberglas Corp., Toledo, Ohio, has announced the availability of a completely fire-resistant pipe insulation.

Factory-applied around the pre-molded and incombustible Fiberglas pipe insulation, FRJ (flame retardant jacket) is a unique type of vapor barrier jacket composed of foil and kraft paper bonded together with a flame-extinguishing adhesive and reinforced with strong Fiberglas strands. It is manufactured by American Sisalkraft Corporation.

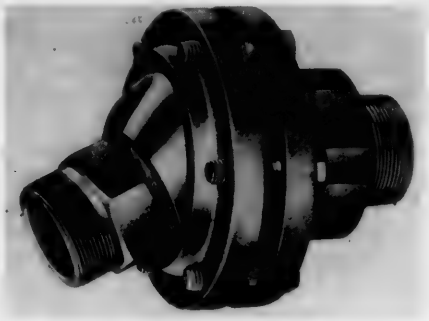
The jacket also is a multi-purpose barrier material that when applied to pipe insulation can be used as a jacket for all types of hot or cold piping up to 400 deg F. When the temperature surrounding the material reaches the combustion stage, gases or vapors are released which tend to smother the flame. Water or weathering conditions have little or no effect on the flame extinguishing properties and the adhesive will not melt or run. The reinforcing glass fibers give the product unusual strength to assure tear and puncture-free application, it is stated.

Shown in photo is a section of the 5 miles of this pipe insulation being installed in the first of three new women's residence halls at the University of Missouri. The elbows have been left exposed to show the insulation and its new covering.

More information? Circle Item 3, postcard, last page.

Larger Adjustable Joints

Three large-size adjustable joints are added to the line of Spraying Systems Co., Bellwood, Ill., for use in spray nozzle installations where variable angular adjustment of the nozzle is desired. These joints are for large-capacity



nozzles with 1½, 2 and 2½-inch NPT connections.

Ball joint design permits positioning at any point over a 40° included angle and 360° rotational range. With these new products, the company now offers adjustable joints in all sizes from ¼ to 2½ inches.

More information? Circle Item 4, postcard, last page.

Miniaturized Control Console

A miniaturized heating and air conditioning control console, known as a Selectografic Supervisory DataCenter was introduced at the 14th International Heating and Air-Conditioning Exposition in Philadelphia by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

The console is designed to enable a building engineer to remain seated while he monitors and adjusts temperatures in any area of even the largest skyscraper. The compact console (dimensions: 4 ft high and wide by 2 ft deep) includes an 11-by-16-inch slide projection screen, up to 35 pushbutton switches (depending on the number of systems to be controlled), a clock, temperature indicator and an intercommunications unit.

The 50-slide-capacity projector is an important operating tool for the building engineer. Each slide contains system diagrams, floor plans, or other building or maintenance data to provide the operator with the information he needs to properly supervise operation of the comfort system.

Whenever the building engineer pushes a button to switch a particular slide on the screen, the operating controls on the console are simultaneously switched to the system represented on the slide. By touching additional buttons, he then can read and adjust temperatures in that area without affecting other parts of the building.

To provide space for additional diagrams, instruments and controls, metal enclosures have been designed for use with the basic Selectographic. Additional control and recording functions can be incorporated at the time of initial construction, or space can be reserved for later building expansion. It also is possible to add on instruments, air conditioning controls, etc., at any time.

When design of a building permits mounting of electrical switching modules near equipment rooms instead of within the console itself, major savings in wiring costs are possible, Honeywell engineers said. Through use of a common wiring system, it would be possible, for example, to reduce the number of necessary wires in a typical 10-fan room building from 140 to only 30.

More information? Circle Item 5, postcard, last page.

For School or Factory

Series OG industrial heaters are designed by Lennox Industries, Inc., Des Moines, Iowa, for either unit heater use or for central applications. Blower operation is quiet enough to be suitable for school, church, and store as well as industrial application, the manufacturer claims. Units are available in output ranges of 280,000 Btu per

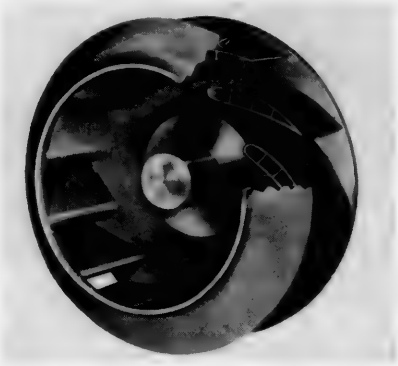
hr and higher, with oil, gas, or combination fuel burners.

Engineering features include: (1) Integrated burner design with new "dual fuel" burner. For combinations, gas and oil are introduced at different points in the same firing assembly—with instant change-over by a single switch; (2) Combination air blower and the individual draft blower mounted on a single shaft and driven by a single motor; (3) Units are built in two separate sections, permitting either blower or furnace sections to be used individually. Blowers are said to be capable of high air deliveries at unusually low sound levels; (4) Heavy-gage stainless steel is used in the cylindrical primary heat exchanger, aluminized steel in the secondary heating surfaces. There are no internal baffles. Expansion joint permits "breathing" without straining of metal.

More information? Circle Item 6, postcard, last page.

Airfoil-Blade Blowers

A line of centrifugal blowers, called Joy-Centrifoil, is said to be an improvement on backward curved fan design. Announced by Joy Mfg. Co., Pittsburgh, Pa., sizes vary from 440 cfm at ¼-inch static pressure for a single-width, single-inlet fan, to more than 460,000 cfm at 16 inches for a double-width, double-inlet fan.



Blades on the new blowers have an airfoil shape, as illustrated in cross-section view. The results, according to the company, are greater efficiency, silent operation, and reduced horsepower.

The new line of centrifugal fans, added to the company's established line of controllable and adjustable pitch vaneaxial fans, permits the company to offer any type of fan for any air movement application. According to the company, the new line meets all the requirements for commercial and industrial heating and ventilating applications as well as those of a forced or induced draft nature.

More information? Circle Item 7, postcard, last page.

Portable Pneumatic Grinders

Thomas C. Wilson, Inc., Long Island City, N.Y., announces development of a line of portable pneumatic grinders. Both lightweight, powerful horizontal grinders and high-speed die grinders are included in the line.

The horizontal grinders (one is shown in photo) are applicable to a wide range of industrial operations such

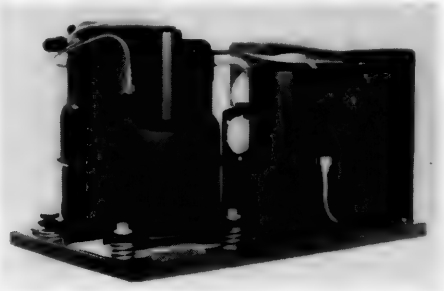
as grinding, buffing, and wire wheel work. They have been designed for ease of handling and reduced operator fatigue in any metal removing or finishing operation. Various sizes and models are available, with speeds ranging from 3100 to 12,000 rpm. Wheel sizes range from three to eight inches in diameter. Lever, straight, or grip-type handles may be specified.

Die grinders have been designed to speed operations in tool and die shops, machine shops, pattern shops, or wherever filing, grinding, cutting and polishing operations are involved. These tools are available in two sizes, with rated speeds of either 40,000 or 60,000 rpm. They are suitable for a wide range of wheel sizes.

More information? Circle Item 8, postcard, last page.

Low-Temperature Unit Added

A compact, ½-hp condensing unit, Model BRL50T, is announced by Evansville Div., Bendix-Westinghouse Automotive Air Brake Co., Evansville, Ind. It has a twin cylinder motor compressor designed for low temperature



applications using refrigerant 12, and supplements the single cylinder line of condensing units in the ½-hp size. R-12 models are now available for both high and low temperature work.

The new models can be supplied in specified voltages of 115 and 230. A high-starting-torque motor, and a built-in liquid-level test port are featured.

More information? Circle Item 9, postcard, last page.

Damper Section Redesigned

Drayer-Hanson Div., National-U.S. Radiator Corp., Los Angeles, Calif., announces major redesign improvements of damper section in its Flexazone central-station air conditioners.

End result is stated to be: an even more positive, sensitive control reduction of outlet velocity air noise; a lower zone outlet velocity, since no blades are removed to provide space for a zone divider; and damper action which incorporates all the features of opposed blade action, since throttling of the air is proportionate throughout the range from full open to full closed, and blade dividers act as straightening vanes for air flow. Improved, more flexible design eliminates crank arms for each rod, and adds a divider blade between each damper blade, affording a simplified means of changing zone sizes in the field. In addition, each model in the 9-model line will be available in 32 different zone arrangements.

On standard units, damper section is zoned at the factory according to individual unit order. Simple instructions furnished with the unit permit quick, easy rezoning in the field.

More information? Circle Item 10, postcard, last page.

Damper, Quadrant Regulators

Development of a line of damper and quadrant regulators is announced by Regulator Div., Elgen Mfg. Corp., Long Island City, N. Y. The regulators offer the most effective methods of controlling dampers to prevent rattles and air leakages, the company states.

Constructed of heavy-gage, cadmium-plated metal, all dial dampers and quadrant damper regulators can be easily mounted on either round or flat surfaces, and provide free and simple operation. Line ranges from ¼-inch damper regulator sets to ½-inch quadrant damper regulator sets for positive control in small dampers or in heavy-duty heating, ventilating, blower, and exhaust systems.

More information? Circle Item 11, postcard, last page.

Drive-In Theater Comfort System

A combination heating and air conditioning unit for individual cars, announced by BTU Industries, Inc., Englewood, N. J., is said to signal a new era for the nation's drive-in theaters. The system, developed by Jet-Heet, of Englewood, N. J., uses forced, filtered air from a small-diameter flexible duct to heat or cool a parked car.

One oil-fired furnace, as shown in photo at left, is used to heat 30 cars, at a cost of only one to two cents per car per night, the company reports; this is much less than drive-in owners now pay to heat cars with conventional electric units.

Leading from the furnace are master insulating ducts, developed by Standard Plastics, of Fogelsville, Pa., that have been installed under the ground parallel to the parking ramps. Small flexible pipes rising from the master duct bring warm air right into the car, as shown at right. The air is dispersed through a diffuser styled to hook over the car window beside the speaker.

A small control damper on each diffuser allows the car occupants to regulate the amount of heating or cooling they desire. Once the diffuser is installed in the window it takes only a few minutes to warm up or cool off a car.

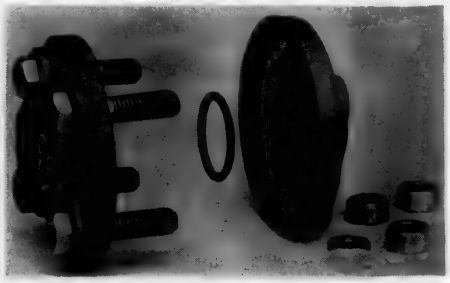
A compact air-conditioning unit (not shown) attaches to each furnace, and the same duct system is utilized to convey high velocity, dehumidified, low temperature air to cars parked in the theater in the summertime.

More information? Circle Item 12, postcard, last page.

Leak-Proof PVC Joint

A complete rigid polyvinyl chloride (PVC) flange union assembly is introduced by Walworth Co., New York, N. Y. Featuring an O-ring seal, it provides a leak-proof joint, the company states.

Assembly consists of a plain face flange, an O-ring grooved flange with a Hycar O-ring, and four nuts and bolts. The fasteners are cadmium-plated as protection against rust and corrosive atmospheric fumes.



In addition, the O-ring gasket facilitates flange union installation. Bolts need only be finger tightened and given a part turn with a wrench, thus eliminating the tendency of overtightening with its possible consequences of scoring or breaking the union.

PVC is exceptionally resistant to most salts, alkalis and acids at temperatures as high as 150 deg F. The flange union is available in sizes from ½ through 4 inches with threaded or solvent-weld socket-type ends in either high or normal impact PVC.

More information? Circle Item 13, postcard, last page.

Split Bearing a Time Saver

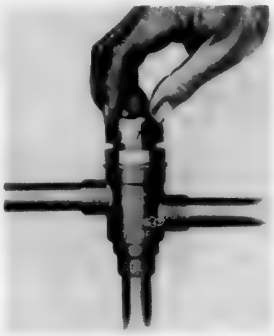
A split bearing is announced by Randall Graphite Bearings, Inc., Lima, Ohio, that permits easy bearing replacement without repositioning or disassembling the unit. Closure of the bearing at any point along the shaft is done quickly.

Developed for intermediate-position installation and replacement on shafts commonly used in many types of units, such as ventilating sets, the split bearing can provide valuable protection to manufacturers who offer warranty period replacement service, the company states. The two-piece all-bronze ball assembly is self-aligning, mounted in the cast iron base and cap of the company's normal-duty pillow blocks. The method of joining the matched halves is said to assure accurate, trouble-free positioning in reassembly. Bearing is available for all standard shafts, sizes 1 3/16 through 3 3/16 inches.

More information? Circle Item 14, postcard, last page.

Dial Hot Water Temperature

Finger-tip adjustment of water temperature by means of a graduated dial knob with integral reference numbers is provided on the Dial Temp mixing valve introduced by General Fittings Co., East Greenwich, R. I.



This ruggedly built tempering valve utilizes the positive action of a fluid-filled, expansion-actuated element to continuously and accurately maintain any desired hot water temperature over the temperature range (110-180 deg F) it offers.

Additional data on the economical valve are available in Bulletin 359 which is offered by the manufacturer.

More information? Circle Item 15, postcard, last page.

Expanded '59 Line Announced

An expanded line of heating and cooling installations for 1959 is announced by Airtemp Div., Chrysler Corp., Dayton, Ohio. Many units are added in order to make the line competitive in every way, the company states.

New Slender room air conditioners, in both window and built-in models, are said to combine a maximum of cooling in a minimum of space, with complete directional control of airflow. The Royal model is available with a control, called the Climate Minder, which measures and balances both temperature and humidity.

Designed as a package installation for all forced air heating and cooling systems, an electrostatic filter is available which is said to remove most of the dust, pollen, germs, bacteria, as well as smoke and odors, from the

circulating air. Dust and pollen control are made possible by a filter which magnetizes particles in the air. A germicidal lamp destroys germs and bacteria. The filter unit, as illustrated, also contains an activated charcoal filter.

The Climate Minder control, available on all of the company's central air conditioning units, is set just once at the desired temperature. The control will then turn on the cooling unit or the furnace, as necessary. Also, air may be circulated without heating or cooling.

Among additional units added to the air conditioning line are: a 7½-hp compressor with 9-ton coil for commercial applications; three commercial packaged units with 21-, 26,- and 30-hp ratings; a 140,000-Btu oil furnace; a 140,000-Btu gas furnace; and two residential packaged units one of 2, and one of 5 hp.

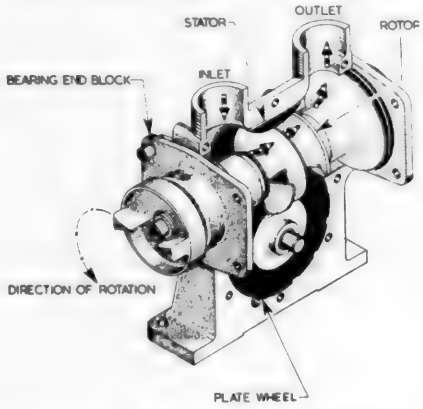
The Power Miser compressor, of die-cast aluminum construction, with oil pre-heater and floating valves, is included on the 5-hp residential unit.

More information? Circle Item 16, postcard, last page.

Rubber-to-Metal Type Pump

Announcement of a rubber-to-metal, positive-displacement type pump is made by Goodyear Pumps, Ltd., England. Pending purchase of manufacturing rights by an American manufacturer, British-made pumps will be exported and their selling prices based on eventual U. S. selling costs, the manufacturer states. The recently formed Goodyear Pumps, Inc., New York, N. Y., is representing the English firm.

According to the manufacturer, the pump, introduced in England in the early part of 1958, is inherently self-priming, offers suction lifts to 30 ft at speeds between



750 and 3,000 rpm, and maintains a reasonably constant capacity at any given speed within these margins at pressures from zero to 100 psi.

Engaging surfaces of the pump are rubber to metal, said to be an important development in the handling of corrosive and abrasive liquids and in moving liquids with solids in suspension. The only lubricating medium is the liquid being pumped. The action of rubber to metal allows for a greater measure of self compensation when wear begins to take place, resulting in a slower rate of deterioration of efficiency and general performance. Easy access of the wearing parts is provided, and rapid replacement on the site by relatively unskilled labor is promised.

With four types of body materials, three rotor materials, and four elastomers, assembly permutations can be produced to satisfy a wide range of applications in marine, mining, and general industry, the latter including food, beverage, and chemical and cosmetic fields.

More information? Circle Item 17, postcard, last page.

Electric Baseboard Heater

A new electric baseboard heater is announced by Ilg Electric Ventilating Co., Chicago, Ill.

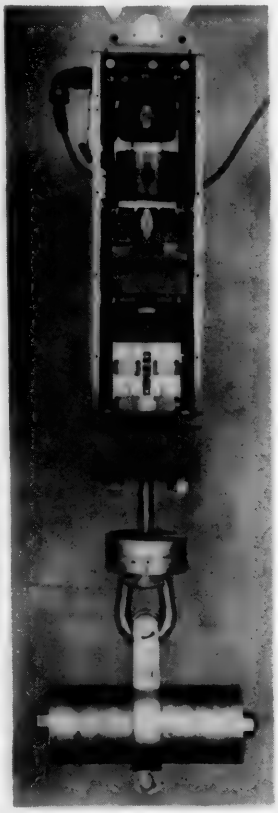
Heating panels come in 2-, 5-, and 8-ft lengths. They can be flush-mounted or recessed against the studding as desired in four easy steps.

After the desired panel lengths are selected, the back panel containing the heating element is screwed or nailed into studs. Then, power is connected to UL-approved splice box by bringing in two wires, from rear, bottom or sides, using raceway. Cover panel is then snapped in place. The final step requires no more than snapping on end caps and corner pieces to provide a completed, harmonious installation. Finished panels have special bonderized finish which bonds paint tightly without a primer.

More information? Circle Item 18, postcard, last page.

Pipe Support Motorized

Stress-Trol, announced by Grinnell Co., Inc., Providence, R. I., is a motorized pipe support for high temperature steam piping. It provides constant support with unlimited load ranges and travels; it controls stresses in piping and equipment; and is available in a choice of three primary control methods plus combinations of the three.



Flexible piping must be provided with free-moving constant supports which permit it to float into positions where it relieves its own stresses as it heats up or cools down, the company explains. Flexibility designed into high temperature steam lines requires the use of considerable extra piping at great costs. The new device is said to permit fewer bends and more direct connections by providing a means of forcing end stresses back into the piping where ample flexibility is available to take care of them.

Power to move loads is fed through wires to a reversible fractional horsepower motor, multiplied through high-ratio reduction gears which operate a ball-bearing jack mounted within the hanger frame. The load goes up or down as required by the conditions of the moment, following the natural or induced movements of the piping, superheater header, etc., as ordered to do by its controls.

Control of the Stress-Trol may be by any one of three sensing systems. The first is load sensitive control. With this type of control, constant support of a predetermined value is provided for the load at all times. The motor-operated hanger contains a load sensing device and a deflection amplifying indicator which operates switches to raise or lower the piping synchronously with its cycles of expansion and contraction.

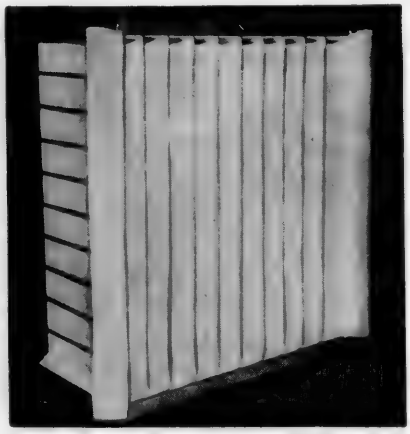
The second type of control is position sensitive and may be used to change the elevation of the hanger in response to a change in relative position of some other element of the piping system or a piece of associated equipment.

The third type is a temperature sensitive control which is used to change the elevation or position of the piping system according to a predetermined temperature expansion curve. Types two and three can be used in combination with type one, load sensitive control. For example, if a change elevation in response to position is wanted, but there is a need to limit the force, use of position sensitive control in combination with load sensitive control is indicated. If the problem is to change the elevation of a superheater header regardless of the force required to overcome friction factors, use of the position sensitive control in relation to some fixed point on the building structure is recommended. For keeping excess stress off either the turbine lead or the superheater outlet, use of the position control would be preferred.

More information? Circle Item 19, postcard, last page.

Folding Air Filter

A convenient, disposable, dry-type filter is announced by Farr Co., Los Angeles, Calif., said to be applicable wherever extra air cleaning efficiency is required. Its economy results from the low cost of the filter unit itself and the time saved in changing filters, the company states.



Called HP-2 High Performance filter, it consists of deep folded pleats of special media which are permanently attached, top and bottom, to chipboard panels. It is completely flame-proof and tear-proof. The filter fits into a matching metal retainer which can be permanently attached to most existing filter holding frames.

Pre-formed, then folded and packed, ten to a carton, at the filter bank the filter is simply popped open and inserted in the retainer. No special tools or skills are required for installation. Folding simplifies handling and reduces storage space.

More information? Circle Item 20, postcard, last page.

Time Switch Serviced Quickly

A time switch case, called Quick-Out, is designed as standard housing for all its time switches, according to Tork Time Controls, Inc., Mount Vernon, N. Y. The new housing will help contractors and servicemen during installation, the company states.

The entire time switch mechanism snaps in or snaps out of the case at a finger-touch. Installation is done in

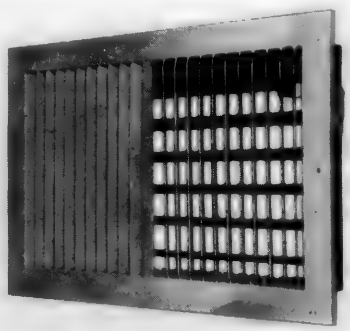
four steps: 1. Snapout control unit. 2. Mount case. 3. Make wiring connections *outside* the case. 4. Snap in wired control.

Because the newly-designed case opens from its center hinge, providing full access to the time switch, resetting of schedules on the switch dial is easy, and wiring connections or changes may be conveniently made without removing the unit.

More information? Circle Item 21, postcard, last page.

Year-Round Registers

Series 120 registers, with multi-louver valves and one-piece face construction, are announced by Air Control Products, Inc., Coopersville, Mich. Said to be especially suitable for year-round air conditioning systems, provision is made for easy raising or lowering of the air pattern.



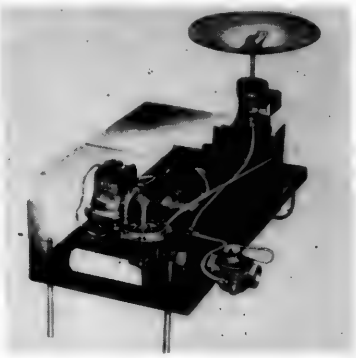
One-piece face construction with half-inch-wide stamped fins provides exceptional strength and large free area, the manufacturer claims. Fins are pre-set 30° out from the center of the face and can be adjusted to provide any horizontal air pattern required by the installation. Vertical control of the air pattern is obtained by moving the conveniently-located operator handle up or down. The operator handle is easily removed for tamper-proof installations.

An adjustable stop permits opening of the valve to a predetermined setting. These registers and grilles are offered in a broad range of sizes, and are fully described in a new catalog available from the company.

More information? Circle Item 22, postcard, last page.

Gas Conversion Burners

Announced by The C. A. Olsen Manufacturing Co., Elyria, Ohio, are three Luxaire gas conversion burners which offer a heating range of 50,000 to 310,000 Btu per hr input. The burners feature a restyled cabinet that has a rounded duct cover, charcoal grey enamel finish and a rigid 14 gage steel base.



Other improvements provide easier installation, adjustment and service. A new design of burner support makes possible removal of the entire burner head-tube and pilot assembly without disturbing the gas manifold. A semi-circular secondary air shutter permits increased control over combustion air and draft; stainless steel flame spreader provides a wider dispersion of the heating flame.

More information? Circle Item 23, postcard, last page.

Solder Joint Valves

Kennedy Valve Mfg. Co., Elmira, N. Y., is producing a line of solder joint valves for copper tubing installations. Designed for modern piping systems, they are for use with types K, L, and M copper tubing.

Design features a distortion-resisting cylindrical-shaped body, and improved Kenalloy stem, said to assure long life and resistance against stem failure. Valves are suitable for a wide range of services, and are easily installed for a perfect solder joint, the company states.

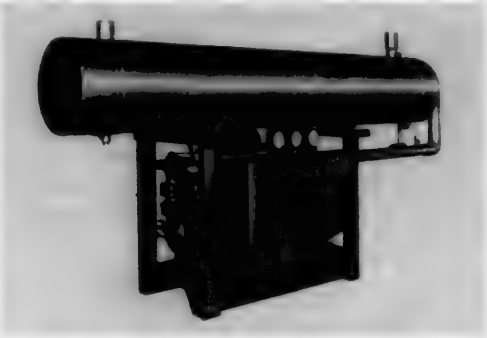
The 427SJ gate valve is used for water or steam lines where full flow is required with minimum pressure drop. For heavier than average steam, water, air or gas line operation, the 89SJ globe valve is recommended, which has a renewable composition disc and union bonnet. The 440SJ check valve is suggested for general service on steam, water, oil or gas lines. It can be installed in horizontal or vertical lines.

More information? Circle Item 24, postcard, last page.

Redesigned Packaged Chillers

A redesigned line of packaged water chillers, for air conditioning or industrial cooling applications, is available from American-Standard, American Blower Division, Detroit, Mich.

Designated Type CD, the chillers are available in nine sizes from 20 to 125 hp. The new design retains copper



tubing with a star-shaped aluminum insert within the evaporator. This tubing configuration has more than double the heat-transfer surface of plain tubing, and adds 25% more cooling capacity per cubic foot of chiller size.

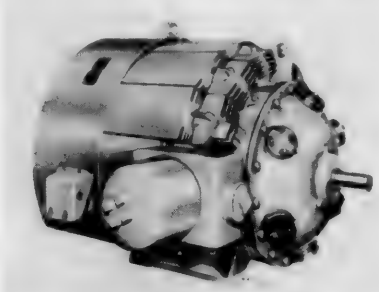
Trouble indicator lights are an added feature of the redesigned models. Should an abnormal condition cause the unit to cut off on any of the four safety controls, the appropriate indicator light will come on to identify the source of trouble.

More information? Circle Item 25, postcard, last page.

Heat Exchanger Motor

The Louis Allis Co., Milwaukee, Wis., announces a new d-c motor designed to provide a wide adjustable speed range. The motor is also intended for constant speed applications, and is available in ratings from 25 to 300 hp.

Called the Heat Exchanger motor, it is constructed in an explosion-proof enclosure (Class I, Group D Underwriters Label) for hazardous installations, and with standard enclosed construction for protection against abrasive



airborne particles, dirt, coolants, moisture, oil vapors and other severe atmospheric conditions.

The range of adjustable speed offered by this motor extends from 5% of base motor speed by armature control (constant torque) to 400% of base speed by field control (constant horsepower). A major factor in broadening this adjustable speed range and in reducing motor size to a minimum is the use of an integrally mounted a-c fan motor to supply a constant flow of cooling air, regardless of the speed of the d-c motor. Heat exchanger tubes of heavy-section, high tensile strength aluminum alloy are distributed around the periphery of the field ring for effective air-to-air heat removal.

More information? Circle Item 26, postcard, last page.

Classroom Unit Ventilators

The Academy line of gas-fired unit ventilators has been introduced by Williams Furnace Co., Buena Park, Calif., and is now in production. According to the company, the line was designed in collaboration with architects and school officials to provide a low cost system of classroom heating, ventilation and air filtering.

The manufacturer points out that because the unit ventilator is a complete factory classroom package, each classroom is provided with its own independent system of controlled heating and ventilation, eliminating the need for a central furnace or boiler room.

Units feature an electrically controlled motorized slide-out damper section that automatically mixes outside fresh air and recirculated room air for proper ventilation. Operation of the damper is controlled by a heating and cooling thermostat mounted in the damper section. Controlled and tempered continuous circulation of air is distributed through double deflection, adjustable air grilles located in the plenum. Optional plenums offer a selection of air discharge pattern. Blower provides 1250 to 1500 cfm and allows eight air changes or more an hour in the average sized classroom.

Ventilator is available in 60,000, 70,000 and 80,000 Btu input for use with natural and mixed gases. Catalog and specification sheets are available.

More information? Circle Item 27, postcard, last page.

New Cartridge for Filters

Cambridge Filter Corp., Syracuse, N. Y., announces a new cartridge for its Aerosolve filters. This cartridge incorporates a compressed glass board frame so that the filter is now capable of operating under conditions of 100% relative humidity. It is also completely fire resistant.

The all-glass cartridge will be interchangeable with the earlier model fiber-board enclosure cartridge at no increase in price.

More information? Circle Item 28, postcard, last page.

Heavy-Duty Units Redesigned

Advanced burner design and substantially lighter weight are among the major innovations in the completely redesigned line of heavy-duty forced air heaters produced by Reznor Mfg. Co., Mercer, Pa.

Designated Series S, the line includes ten sizes ranging in capacity from 400,000 to 2,000,000 Btu per hr. All sizes are available for gas, oil or dual-fuel firing and for up-flow, down-flow, or horizontal installation. These

heaters may be used in a duct system or with a discharge plenum with interchangeable louvered outlets which provide complete flexibility in the selection of the air distribution pattern, the company states.

The company's exclusive burner assembly includes a ceramic-lined burner block, a special burner ring with integral air guide vanes, and a simple electric ignition unit. The primary control unit on all heaters is a Minneapolis-Honeywell Protectorelay which automatically programs burner operation. The electronic control system also includes a Flameguard (lead sulphite) Photocell flame detector circuit.

Shipping weights on the new units range from 200 to 1500 lb less than on the previous design.

More information? Circle Item 29, postcard, last page.

Steam Atomizer Developed

Development of a steam-atomizing burner system for its Powermaster packaged automatic boiler is announced by Orr & Sembower, Inc., Reading, Pa., who states that while steam atomization has been popular for many years in larger installations, it had not been adapted to packaged firetube boilers. The importance of steam atomization lies in its ability to burn heavy low-cost oils, such as Bunker C and No. 6.

Steam atomization is also being furnished for separate O&S fuel burning systems, and can be easily installed on company's existing air-atomizing packaged boilers and fuel burning systems.

The new atomizing system uses steam from the boiler at approximately 40 psi to break fuel oil into a fine mist for firing. During start-up, air atomization is used until sufficient steam pressure has been generated. Steam atomization is said to provide clean and complete combustion of even the heaviest grades of oil to a greater extent than any other method of atomization. There are no moving parts in the system and the purging flow of steam keeps the nozzle clean on shutdown. Savings claimed include reduced electrical and maintenance charges since the motor-driven air compressor is used only for starting.

More information? Circle Item 30, postcard, last page.

Diffuser Made in Plastic

A non-corrosive, flame-retardant, rigid, high-density polyethylene ceiling diffuser is announced by AirGuide Plastics Corp., Miami, Fla. Said to be available at a fraction of the cost of metal diffusers, the line is currently being produced in sizes to fit standard ducts and dampers, or for direct-to-ceiling installation.

Diffusers are molded from Grex, a plastic developed by

Polymer Chemicals Div., W. R. Grace & Company. The new product is guaranteed by its manufacturers to withstand the temperatures under actual heating and air-conditioning usage.

According to the manufacturer, a feature of the diffuser is a molded-in Air-Loc triple seal which provides an air-tight closure at the duct opening without gaskets. Step-down design is provided with a wide anti-smudge ring. Various pastel colors, as well as white, are available, eliminating painting.

More information? Circle Item 31, postcard, last page.

Heat Gain Calculator

A useful tool for determining air-conditioning loads is the Heat Gain Calculator, on the slide rule principle, developed by Libbey-Owens-Ford Glass Co., Toledo Ohio.

The calculator will provide the instantaneous heat gain in Btu per hr per sq ft of window area due to directly transmitted solar and sky radiation, plus the energy admitted to the room after absorption in the glass of both sun and sky radiation.

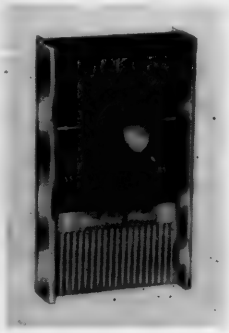
Calculator has two separate scales. One produces the heat gain values at certain latitudes, for certain dates and hours of the day, and six different types of window glazing. The other provides the factors for convected and conducted heat gain due to temperature difference between outside and inside temperatures.

Heat gain values in the calculator are based largely on material published by the American Society of Heating and Air-Conditioning Engineers in the ASHAE Guide and research reports. A nominal charge of 50 cents is being made for the calculator.

More information? Circle Item 32, postcard, last page.

Electric Heat Wall Thermostat

A contemporary-styled electric heat wall thermostat is introduced by White-Rodgers Co., St. Louis, Mo. Offered as a deluxe companion to the company's line of electric heat controls, the thermostat is named Type 1A65. Finished in gold and beige vinyl-leather, the unit is designed to blend into any modern decor.



Under the styling of the unit is a control built to maintain a constant level of comfort in electrically-heated homes. Actually a highly-sensitive thermal element, the control knob of the 1A65 is fully exposed to both room temperature and radiant heat. Any change in comfort level is immediately sensed by the element, and the silent switch is instantly actuated to compensate.

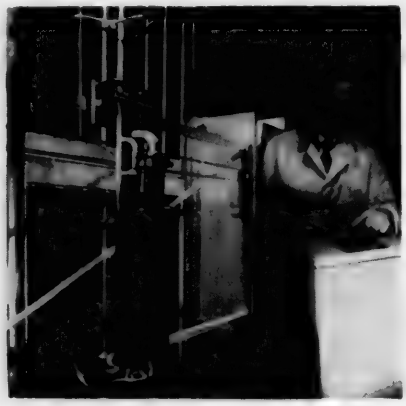
In addition to the heat range selection of 55 to 85 deg F, the unit has a *cold* position on the dial. At this position, one side of the power line is disconnected for shut-down, as for weekends or vacations. No separate disconnect switch is needed.

More information? Circle Item 33, postcard, last page.

Three New Air Cleaners

A Selector series of electronic air cleaners that offers a building owner a choice of three specific cell designs to best meet his particular needs is introduced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. All models utilize a traveling water spray manifold that provides a heavy stream of water, said to clean collector plates quickly and efficiently. The following models are offered:

(1) The Hi-Velocity cell, which provides for removal of 99% of the dirt particles in the air when operated at 400 fpm. This model is designed for use in hospital,



laboratories, etc., where extraordinary cleanliness is required. (2) The Advanced Capacity/Maximum Efficiency cell, which offers air-cleaning efficiency of 90% at 600 fpm and can be used in most normal air conditioning or ventilating systems. (3) The Hi-Load cell, with an air-cleaning efficiency of 90% at 420 fpm, is designed for applications where wider collector plate intervals are needed to reduce frequency of washing. Examples are industrial buildings and bowling alleys.

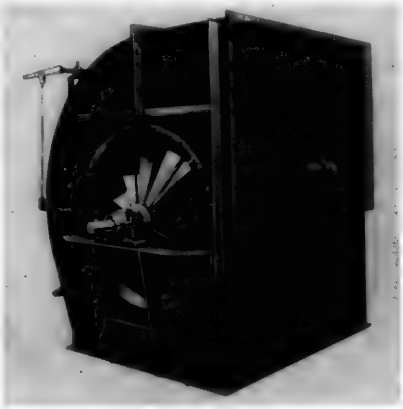
Each cleaner utilizes the new cell-washing concept that is described as the most effective cleaning system yet devised. Each washing assembly has a traveling water spray manifold coupled with a dirt-emulsifier spray manifold. This double manifold travels across the face of the cleaner on rails, driven by a chain that can be either motor-powered or manually operated. Water first is sprayed on the cells to wash off collected dirt, then a dirt-emulsifier is sprayed on the clean plates to give them a water-soluble coating. In the washing operation, a number of nozzles on the manifold agitate rapidly to provide uniform and thorough coverage. This unique flip-flop action also prevents clogging of nozzles.

All models in the Selector series can be equipped with Honeywell's activated charcoal filters. The electronic air cleaners remove dirt particles, smoke, pollen and other irritants from the air, while the activated charcoal filters remove odors.

More information? Circle Item 34, postcard, last page.

Twelve-Bladed Airfoil Fan

Incorporating an airfoil, backward-curved blade design, Type AF Dynafoil fan has been announced by Clarage Fan Co., Kalamazoo, Mich. It is particularly adaptable to mechanical draft and heavy-duty application, the company states. Further, each part in the assembly is built to close tolerance, thus assuring a production fan which will perform as rated.



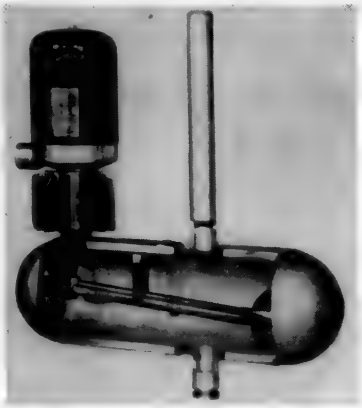
Wheel is built with twelve aerodynamically shaped blades which in combination with the streamlined contour of the inlet permits continuously smooth flow of air through the fan. Turbulence is said to be reduced to a minimum, making the fan highly efficient and quiet. The blades are of one-piece die formed construction, welded to the rim and backplate. Internal struts inside the hollow section are provided in blades of fan for higher tip speed classes.

Fans are offered in thirteen sizes for mechanical draft and in Classes II, III, and IV for heavy-duty industrial applications. They are also well adapted to conduit type air conditioning systems and tunnel ventilation.

More information? Circle Item 35, postcard, last page.

High Temperature Control

Model 402 liquid level control for high pressures and temperatures is announced by Magnetrol, Inc., Chicago, Ill. Unit is an external float cage of all welded design that mounts by means of two beveled welding nipples of one-inch schedule 80 steel pipe. Body is formed from



two sections of 5-inch Schedule 80 seamless alloy steel pipe. A welding procedure developed for use on the submarine Nautilus is used in making the final circumferential weld to join the two body halves.

Switch mechanism will operate safely at liquid temperatures to 1000 deg F, the company states. Rating of the unit ranges from 1668 psia at minus 20 to plus 800 deg, to 867 psia at 1000 deg. Photo is view of cut-away model displayed at the Power Show in New York.

More information? Circle Item 36, postcard, last page.

Smokeless Oil Furnace

The Custom Mark I oil furnace, developed by Iron Fireman Mfg. Co., Cleveland, Ohio, is said to be completely cleanburning and never in need of adjustment after installation. Tests indicate up to 33% fuel savings over conventional oil furnaces, the company states.

A completely new method of injecting fuel and air into the combustion chamber is used. The unit does not use the conventional gun-type burner arrangement. Instead, a combustion flow system smoothly draws fuel and air through the burner, using mechanical draft under precision control. According to the manufacturer, this system produces a quiet, easy-burning, but hightly efficient flame.

Because the furnace does not use natural draft, it operates equally well under any and all chimney conditions. In new installations the furnace does not require a chimney. A small exhaust vent to the outdoors suffices. Also, because complete combustion of fuel is achieved, soot and smoke are entirely absent, even at the start of the burning cycle. Simplified design of the injection system and highly sensitive thermostatic control provide firing cycles said to be much faster and within much closer temperature limits than with conventional oil furnaces.

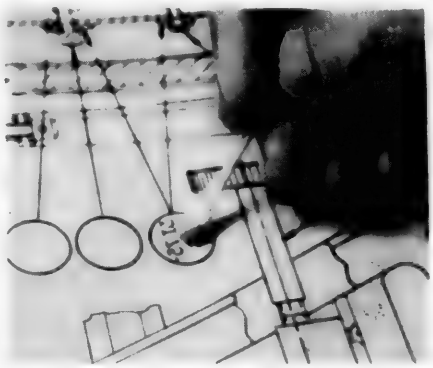
A vertical model is available in four heating capacities —85,000 through 160,000 Btu per hr; the horizontal model is available in six heating capacities—from 84,000 through 250,000 Btu per hr output.

More information? Circle Item 37, postcard, last page.

New Diazo Film

Development of a new Diazo sensitized film for producing duplicate originals is announced by Eugene Dietzgen Co., Chicago, Ill. Known as Perma-Scale Intermediate Film, according to the manufacturer, the Mylar base of this new material provides increased ease of eradication, extraordinary toughness and dimensional stability.

The film is sensitized on its glossy reverse side. Thus, repeated eradiation on this glossy surface cannot affect the front matté surface for making engineering changes. Lines from the original drawing are easily eradicated



with a cotton dauber dipped into a mild, solvent-type chemical, or with an ordinary typewriter eraser and erasing shield.

The company states that in many cases better prints can be obtained from the duplicate original than from the original drawing, and that the film retains its original flexibility and transparency almost indefinitely, being virtually impervious to water and perspiration. Available in both sepia and black line.

More information? Circle Item 38, postcard, last page.

750-HP Package Boiler

Its new 750-hp package steam generator is the highest capacity package fire-tube boiler ever offered, states the manufacturer, Cyclotherm Div., National-U.S. Radiator Corp., Oswego, N. Y. Unit delivers 26,000 lb steam per hr at over 80% efficiency, the company states, but because of an exclusive combustion principle, it is no larger than most 500-hp package generators. Overall dimensions are 28 ft by 9 ft 6 inches by 10 ft 8 inches.

More information? Circle Item 39, postcard, last page.

Boiler Blow-Off Valve

A new Unit Tandem blow-off valve for boiler blow-off pressures up to 665 psi, basic rated pressure 400 psi, is announced by Yarnall-Waring Co., Philadelphia, Pa. It is reported that all the dependable qualities of the company's original Unit Tandem blow-off valve have been built into this medium pressure design, and at a competitive price.

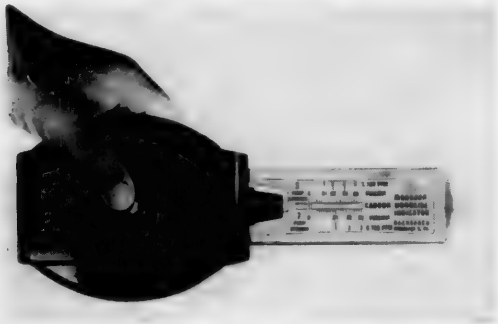
A sturdy forged steel block forms a common body for both the hard seat blowing valve and the seatless sealing valve. The hard seat blowing valve is of the Welbond type with an integral welded stellite seat. This design permits no leakage between seat and body which sometimes occurs with screwed-in seat rings. Valve stem is Type 303 stainless steel which gives adequate protection against pitting.

Valves are available with either flanged or welding ends, right or left-hand assembly.

More information? Circle Item 40, postcard, last page.

Direct-Reading CO Indicator

Bacharach Industrial Instrument Co., Pittsburgh, Pa., introduces its pocket-size Monoxor indicator for detection and direct percentage measurement of carbon monoxide. The instrument, mechanically-operated, has no electrical circuit and therefore may be used in the presence of flammable gases. Because it indicates percent CO by measurement of the length of a stain developed in an indicating tube, color comparison is eliminated and the



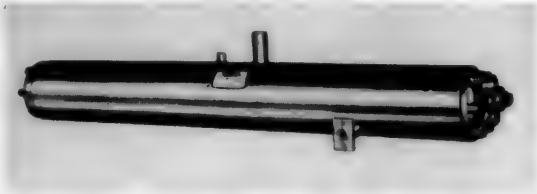
visual color response of the operator cannot affect results. Furthermore, this method assures easy, accurate reading over an extremely wide range of lighting conditions, the company states.

The indicator, measuring 5 by 4 by 1½ inches, is said to safeguard life and health wherever carbon monoxide hazards may exist, including homes and public buildings where gas burning appliances are used, and in confined spaces such as mines, vehicular tunnels, bus terminals, garages, etc.

More information? Circle Item 41, postcard, last page.

Condenser Cleans Easily

Development of Type CSTC cleanable shell and tube condensers is announced by Heat-X, Inc., Brewster, N. Y., a subsidiary of Dunham-Bush, Inc.



These units, which are available in a wide range of sizes, 5 through 100 tons, are heavy-duty high capacity condensers which are specifically designed to simplify the mechanical cleaning necessary in areas where poor water conditions exist.

The rigidity of the internal condenser is assured by combining five tubes in a "bank." These "banks" are securely bracketed internally, to provide a rigid, vibration-free tube arrangement, the company states.

More information? Circle Item 42, postcard, last page.

New Line of V-Belt Drives

A completely new line of V-belt drives, featuring smaller and lighter sheaves and V-belts of higher capacity at substantially lower cost, is announced by Dodge Manufacturing Corp., Mishawaka, Ind.

Introduced under the tradename Dyna-V, the line covers the complete range of horsepower capacities available in conventional drives. Savings in space, weight and cost are made possible by advances in developing stronger metals for sheaves, and synthetic rubbers and fibers for belts. With the new line, the majority of industrial drives can be handled with belts only ⅜-inch wide, and sheaves that are greatly reduced in both width and outside diameter.

Dyna-V drives are offered in two standard groove sizes to meet all except the largest industrial requirements. Besides the ⅜-inch (nominal top width) size, known as 3V, the company is manufacturing a 5V, or ⅝-inch size for higher horsepowers. Sheaves in the 3V series, from one to 10 grooves, are designed for drives ranging from one to 50 hp. The 5V series will include sheaves to take from three to 10 of the ⅝-inch belts, and will handle drives up to 200 hp.

More information? Circle Item 43, postcard, last page.

(Continued on page 114)

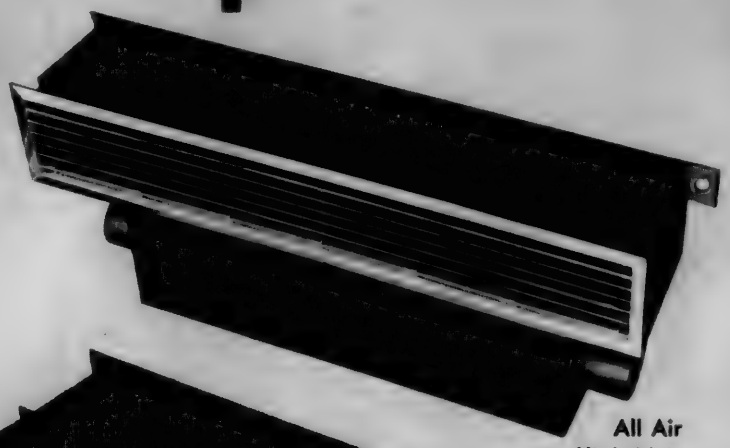
ANEMOSTAT®

is a registered trademark for a wide range of air diffusion equipment

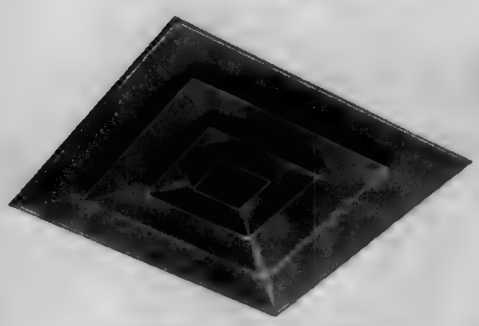
Today Anemostat offers an impressive variety of air diffusion equipment to meet every architectural and engineering requirement. ANEMOSTAT® is a registered trademark. It is your guarantee that every unit bearing this name is of highest quality . . . backed by the most experienced engineering, research and testing laboratories in the industry.

When Anemostat Air Diffusers are in sight the system is right. This was true yesterday, is true today and will be true tomorrow.

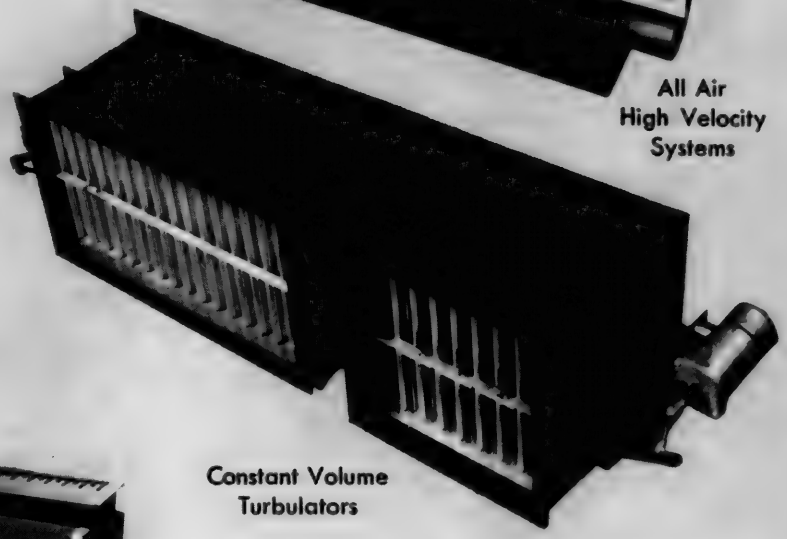
Conventional Air Diffusers



All Air High Velocity Systems



100% Induction Air Diffusers



Constant Volume Turbulators

High Velocity Systems for Schools

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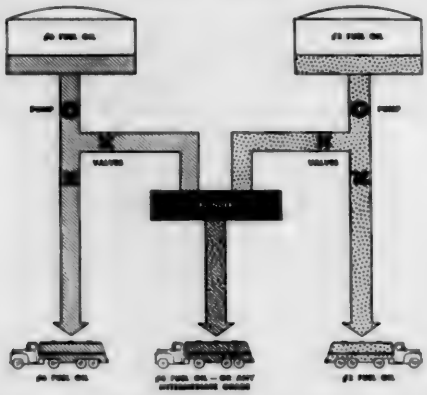
"No Air Conditioning System Is Better Than Its Air Distribution"

AC1370

(Continued from page 112)

Fuel Oil Blending System

B-I-F Industries, Inc., Providence, R. I., announces a complete package system for blending No. 4 and 5 oils, or any intermediate grade, from No. 2 and 6 oils at rates up to 500 gpm. Larger capacity units are also available. Use of the company's Proportioneers blender saves



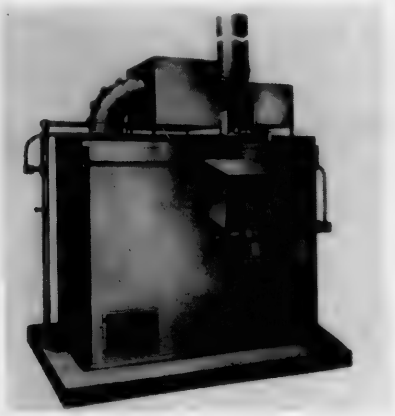
storage tanks, and enables greater product sales from smaller inventory by the sales of three and four oil blends while inventorying only two.

As indicated in the schematic diagram, the heavy viscosity No. 6 oils for industrial use can be blended accurately with light viscosity No. 2 oils for domestic to produce the intermediate blends for churches, department stores, housing projects, theatres, etc.

More information? Circle Item 44, postcard, last page.

Meets Pollution Codes

An incinerator designed and built by Winnen Incinerator Co., Bedford, Ohio, is said to reduce smoke, odor and fly ash to amounts that easily meet the most strict pollution codes.



In addition to multiple burners and combustion chambers, incinerator has an automatic lock on the feed door and a water wash. The feed door cannot be opened until the temperature in the secondary combustion chamber reaches a pre-set heat sufficient for maximum operating efficiency. The water wash captures any remaining fly ash and reduces any smoke. A special blower provides the right amount of up-draft through the water wash and greatly reduces chimney requirements.

More information? Circle Item 45, postcard, last page.

Water Pressure Type Atomizer

Addition of Amco Aero-Miser, a water pressure type atomizer, to its line, makes it possible for American Moistening Co., Cleveland, N. C., to supply either suction or water pressure atomizers for use in straight humidification, evaporative cooling, or split systems with central station air conditioning.

The water is atomized internally, with a minimum requirement of compressed air, delivering an easily vaporized mist of fine quality, the company states. At each control operation the cleaning wire cleans the water jet.

Ruggedly constructed, using brass for the body, hard bronze for the water nozzle, stainless steel for the cleaning wire, and Neoprene-coated nylon fabric for the control diaphragm, the unit is available from stock in standard capacities from 6 to 15 lb water per hr.

More information? Circle Item 46, postcard, last page.

Pressure-Sensitive Foam

Air-O-Seal Foam is a pressure-sensitive polyurethane plastic foam that adheres to any clean surface after removal of backing sheet. Offered by Air-O-Plastik Corp., Union City, N. J., it is said to be of extremely light weight (about one-third that of rubber) and to have insulation properties about twice that of cork.

Among its qualities the company lists that of high resiliency with minimum compression set; superior damping quality to minimize the influence of vibration; high resistance to temperature extremes; excellent sound-deadening characteristics; chemical inertness; resistance to corrosive attacks, fungus, and termites; imperviousness to water; and resistance to oils and most chemicals.

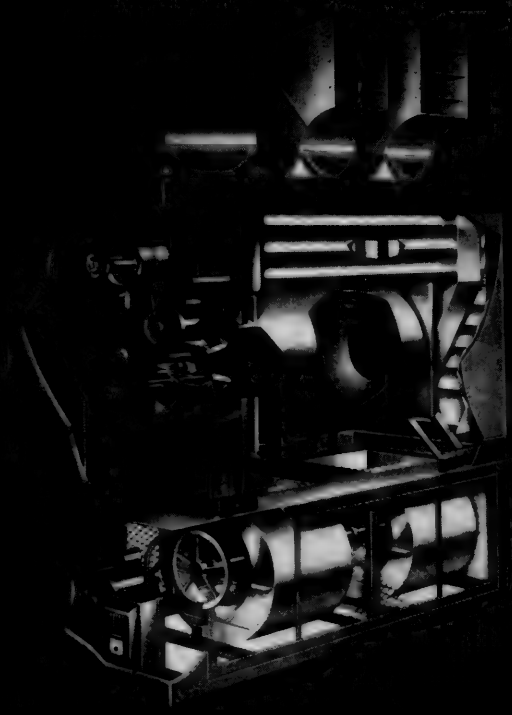
Insulation is available in varying thicknesses, assorted sizes and colors, and in numerous die-cut patterns to specifications as well as in standard rolls, blocks, or sheets. Applications include shock protection of instruments; suppression of chatter in machinery, vibration in transit, and operating noise; and dust-tight sealing and insulation of components.

More information? Circle Item 47, postcard, last page.

(Continued on page 116)

LENNOX INDUSTRIAL HEATERS

Unsurpassed in efficiency



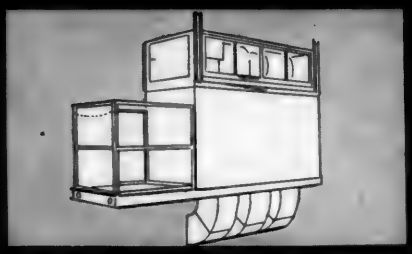
. . . low in operating costs year after year

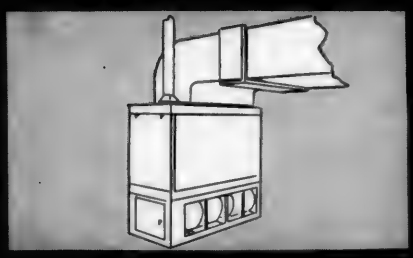
- COMPETITIVE ORIGINAL COST
- HORIZONTAL, VERTICAL OR SUSPENDED INSTALLATION
- GAS, OIL OR COMBINATION BURNERS
- FOR SPACE HEATING, VENTILATING, MAKE-UP AIR, DRYING AND OVEN APPLICATIONS

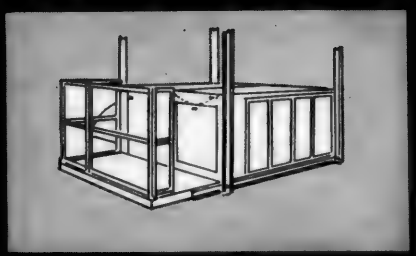
Lennox offers a complete line of industrial heaters designed for any type installation. Simple and effective design eliminates complicated parts . . produces an efficiency rating of 80% or better!

In some units the "task-matched" blower section can be used for air conditioning, providing up to 25 tons of cooling. A wide choice of super quiet blower motors and drives satisfies all air volume requirements.

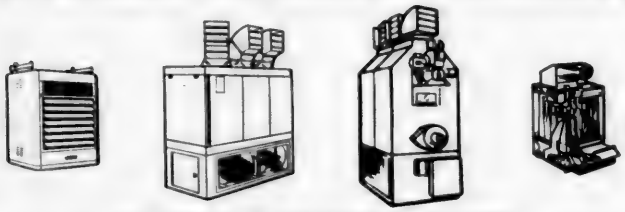
You're assured of the highest quality equipment in the heating, ventilating and air conditioning field when you specify "Lennox or approved equal."







LENNOX "Task-Matched" Equipment to condition and control air for industry



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Industrial Division, Dept. AC-2
Box 1294, Des Moines 5, Iowa

Please send me—without obligation—complete specifications and engineering data on Lennox Industrial heaters.

Name_____

Company_____

Address_____ City_____

Title_____

LENNOX Industries Inc.
INDUSTRIAL DIVISION
DES MOINES, IOWA

THERE'S A LENNOX REPRESENTATIVE NEAR YOU

(Continued from page 114)

Packaged Boiler Return System

A boiler return system has been put on the market by Liqui-Therm Products Co., Brookfield, Wis. The system features clean, modern lines with pump, motor, and tank a single, compact unit. It is a true packaged unit, the company reports, with all gages, valves, vent and return openings complete and in place, ready to pipe.

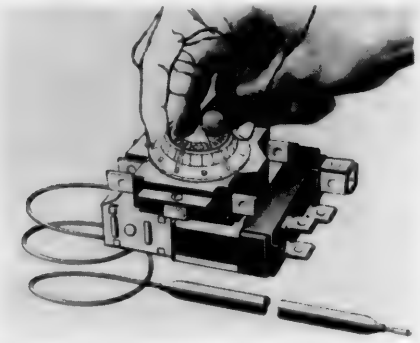
Standard systems are available for operation with boilers from 10 through 100 hp, and pressures up to 200 psi. Special or larger units are available to meet any specific requirement.

Three receiver sizes are offered with 50, 80, and 130-gal tank capacities. Units are furnished either with turbine type pump or with centrifugal pump. Largest unit occupies floor space only 36 inches long by 45 inches wide, and is 39 inches high.

More information? Circle Item 48, postcard, last page.

Cycling Thermostat Controls

Two series of cycling thermostat controls for shallow depth mounting and side access to terminals are introduced by Ranco Inc., Columbus, Ohio. Designated C21 and C22, controls are designed to operate window or unit air conditioners, compressors, strip heaters, and reverse-cycle heat pumps under cross ambient conditions and in a wide range of applications.



Both controls are designed for mounting in units where space depth is a problem, and to offer easy access for servicing. A new dial-within-a-dial circuit selector switch available with the thermostats adds performance flexibility to fit the controls to a vast number of applications in the air conditioning field, the company states.

Series C21 is available as thermostat alone or with the new dial-within-a-dial manual rotary circuit selector switch to provide up to four circuits for compressors or strip heating and step operation of compressors or heaters.

Series C22 control is available as thermostat only or with the same rotary circuit selector switch. The control automatically operates heat pumps with reversing valves with or without de-icer controls, two-stage units with stand-by capacity and dehumidification systems with reheat. It can control two, three or four different devices. Six terminals are provided on the thermostat and, with the circuit selector switch, up to four circuits are possible to control various air conditioning applicatons.

More information? Circle Item 49, postcard, last page.

Bearings Resist Vibration

Pillow block bearings with durable housings of ductile material that resists shock and vibration are among the ball bearing units announced by Hoover Ball and Bearing Co., Ann Arbor, Mich.

These lightweight pillow block bearings —together with companion flange bearings, also with ductile housings—are designed to meet the need for low-cost quality-made units to carry light loads at normal speeds, the company states.

Bearings are made with an extended inner ring, two set screws for locking the bearing to the shaft, and elongated bolt holes for easy mounting. Other construction features include compensation for normal shaft misalignment, factory lubrication, effective Neoprene seals and a standard grease fitting for service requiring relubrication. The pillow block units are available in shaft sizes from ½ through 1 3/16 inches.

Also included in the company's new line are units with heavy cast iron housings for normal duty. Design of these units includes eccentric collar-type shaft lock and automatic self-alignment, achieved because the bearing is spherically seated in a matching spherical housing socket. Felt seals and metal shields are said to effectively lock lubricant in, contaminants out. Where service requires, relubrication is simplified by a standard grease fitting. Shaft sizes from ¾ through 2 15/16 inches are available.

More information? Circle Item 50, postcard, last page.

(Continued on page 118)

Corrosion-resistant, fireproof vents

...with eye-appeal!

Vertical exposed flues of Transite Vent Pipe form eye-catching design on new Rockwell Manufacturing Co. installation

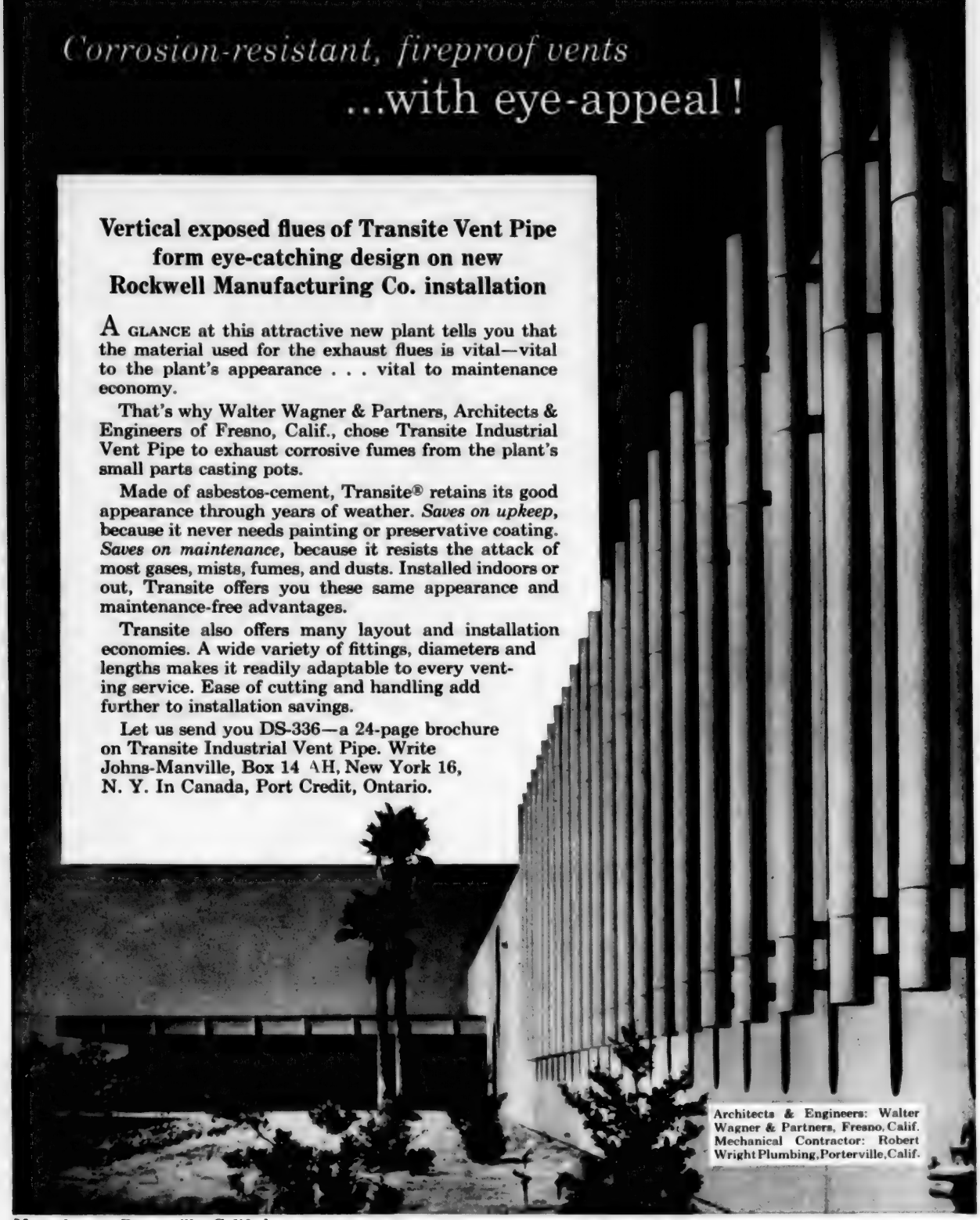
A GLANCE at this attractive new plant tells you that the material used for the exhaust flues is vital—vital to the plant's appearance . . . vital to maintenance economy.

That's why Walter Wagner & Partners, Architects & Engineers of Fresno, Calif., chose Transite Industrial Vent Pipe to exhaust corrosive fumes from the plant's small parts casting pots.

Made of asbestos-cement, Transite® retains its good appearance through years of weather. *Saves on upkeep*, because it never needs painting or preservative coating. *Saves on maintenance*, because it resists the attack of most gases, mists, fumes, and dusts. Installed indoors or out, Transite offers you these same appearance and maintenance-free advantages.

Transite also offers many layout and installation economies. A wide variety of fittings, diameters and lengths makes it readily adaptable to every venting service. Ease of cutting and handling add further to installation savings.

Let us send you DS-336—a 24-page brochure on Transite Industrial Vent Pipe. Write Johns-Manville, Box 14 AH, New York 16, N. Y. In Canada, Port Credit, Ontario.



Architects & Engineers: Walter Wagner & Partners, Fresno, Calif. Mechanical Contractor: Robert Wright Plumbing, Porterville, Calif.

New plant at Porterville, Calif., has twenty-two 8″ Transite exhaust flues. Joined by 14-gauge metal bands, each flue has clean, unbroken appearance.

JOHNS-MANVILLE JM JOHNS MANVILLE PRODUCTS

(Continued from page 116)

Transistorized Motor Operator

An electronic transistorized motor operator for individual proportional applications, designed for damper and valve control in heating, ventilating and air conditioning systems, is added to the motor operator line of Barber-Colman Co., Rockford, Ill. Compactness and

simplicity never before realized are made possible through application of transistor components in the electronic circuitry of the new operator, the company reports.

Electronic flexibility—meaning choice among sensing elements, selection of compensated control, wide adjustability and range and ratio settings—is part of the package the company offers in this motor operator.

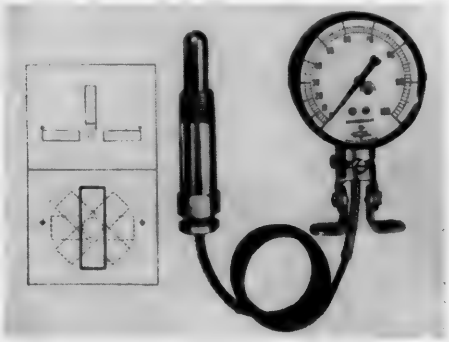
Virtually self-contained, the simple attachment of a two-wire sensing element to a transistor operator forms a system of electronic control. Connection to any convenient 115-volt power source completes the installation. This kind of control is seen as being particularly suited to induction units, reheat coils, multizone dampers, and double duct mixing boxes.

More information? Circle Item 51, postcard, last page.

Thermometers for Piping Systems

Dial thermometers, designed expressly for piping systems, are announced by Jas. P. Marsh Corp., Skokie, Ill.

An emphasized feature of the thermometers is ease of reading; the large legible dials can be tilted and swivelled to any convenient reading position. The diagram shows how the dial can be adjusted so that it can be brought



into an ideal viewing position regardless of the point or plane of installation. Another important provision is the brass, separable sockets, union-connected, which facilitate installation and have necks long enough to clear the piping insulation.

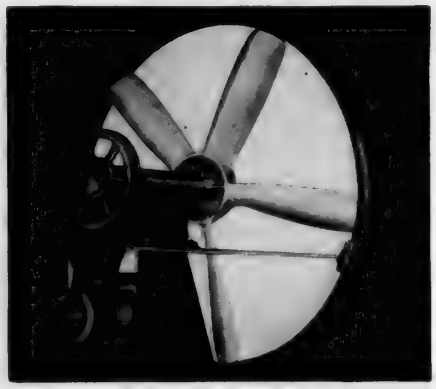
Two types are available: direct-mounted type for location at the point of measurement; and distant-reading type, illustrated, with 6 ft of capillary tubing for installation where it is desirable to locate the dial some distance from the point of measurement. The thermometers are the vapor tension type in which varying vapor pressure caused by temperature changes is exerted on a bourdon tube to indicate temperatures with a high degree of accuracy.

More information? Circle Item 52, postcard, last page.

Slow-Speed, High-Cfm Fans

A line of quiet-operating, slow-speed, belt-driven fans is introduced by Propellair, Div. of Robbins & Myers, Inc., Springfield, Ohio. Designated Type CB, the fans are designed for use wherever large volumes of air must be moved at relatively low noise levels and moderate pressures. Such applications would include power plants, auditoriums, stores, and manufacturing areas where quiet operation is required.

Fans are designed principally for wall mounting; standard and heavy duty shutters are available for such



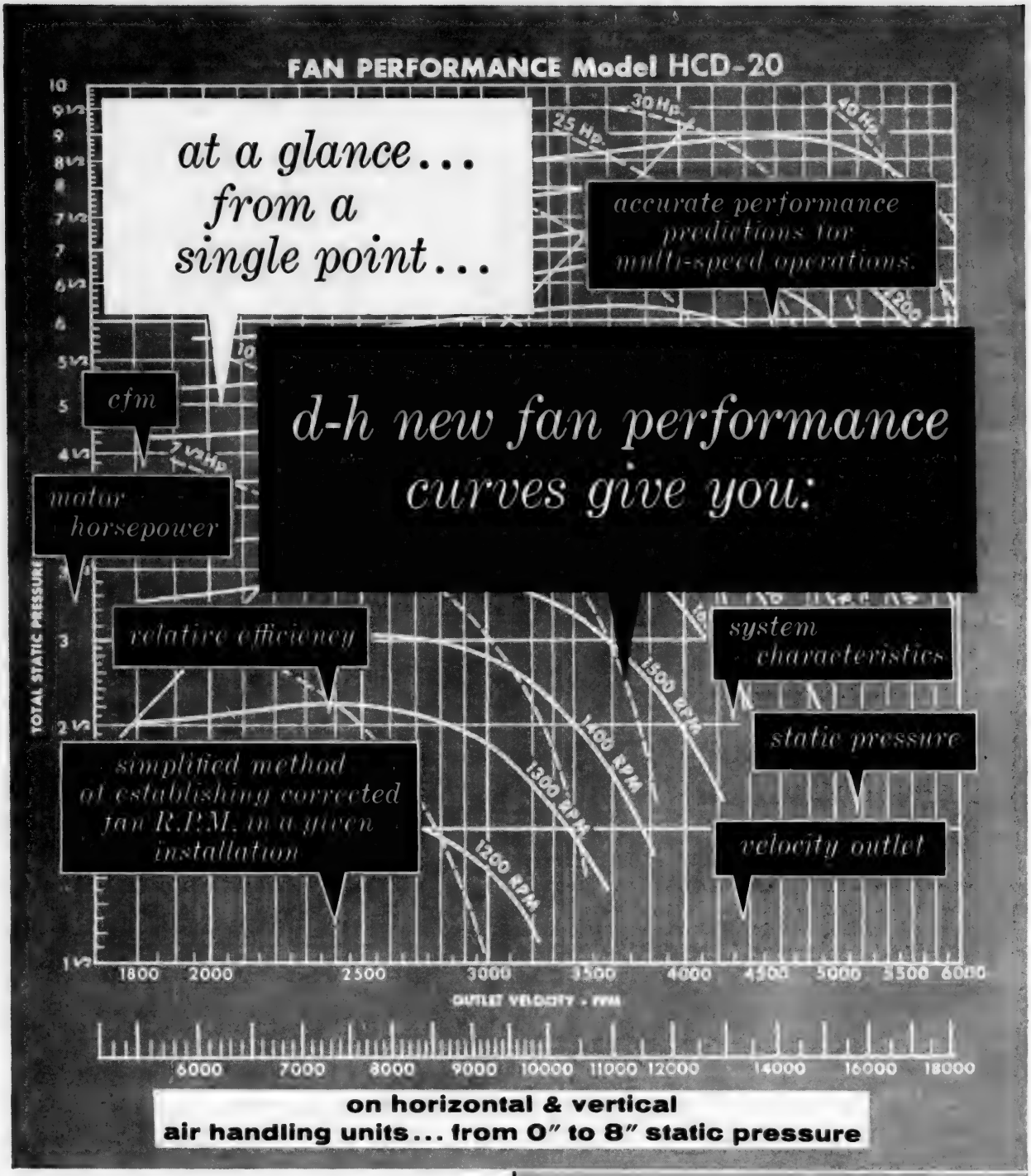
installations. They are also designed for use in the company's Sky-Blast power roof ventilator line. They are available in 42, 48, 60 and 72-inch sizes with free air deliveries ranging from 14,200 to 58,100 cfm.

The high-efficiency airfoil section propellers that are used have non-overloading characteristics and are cast of spark-proof aluminum-magnesium alloy, said to impart great strength and eliminate bending fatigue. These one-piece blades are in static and dynamic balance.

Fans use a heavy-duty bearing assembly equipped with oversize, sealed, prelubricated, cartridge ball bearings mounted in a steel housing to assure permanent alignment. The same bearing assembly is used on all Type CB fans of any one size regardless of horsepower, thus facilitating horsepower changes merely by changing motors and modifying the V-belt drives. Totally-enclosed, all-weather motors power the fans.

More information? Circle Item 53, postcard, last page.

(Continued on page 120)


FAN PERFORMANCE Model HCD-20
at a glance... from a single point...
accurate performance predictions for multi-speed operations.
d-h new fan performance curves give you:
cfm
motor horsepower
relative efficiency
simplified method of establishing corrected fan R.P.M. in a given installation
system characteristics
static pressure
velocity outlet
TOTAL STATIC PRESSURE
OUTLET VELOCITY - FPM
on horizontal & vertical
air handling units... from 0" to 8" static pressure

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DIVISION OF NATIONAL U. S. RADIATOR CORP.
3301 MEDFORD STREET
LOS ANGELES 63, CALIFORNIA
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DRAYER-HANSON, P.O. BOX 2215,
TERMINAL ANNEX, LOS ANGELES 54, CAL.

PLEASE SEND CHARTS-XXX

NAME

FIRM NAME

ADDRESS

CITY STATE

(Continued from page 118)

Miniature Flow Meter

Cat. 300, a miniature flow meter, is available from The Henry G. Dietz Co., Inc., Long Island City, N. Y. The simple device shows if fluid flow is taking place and meters the quantity.

Rate of flow is measured by the movements of a variable position orifice visible through a Pyrex glass tube. An adjacent scale calibrated from 0 to 10, is used in conjunction with a calibration chart supplied with the meter. By setting a hand valve so that the metering orifice is opposite the correct flow rate as indicated on the chart and scale, the desired fluid flow is obtained.

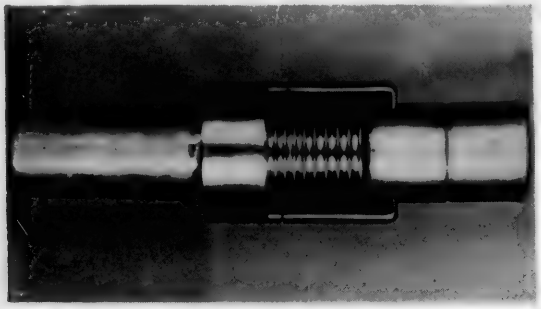
Meter is suitable for a maximum pressure of 100 psi, and may be purchased in various capacity ranges from a low of ¼ gpm to 4 gpm at the high end of the highest range. Unit inserts into ¼-inch IPS pipe line. It measures 4⅞ inches long by 1-1/16 inch dia, its small size permitting mounting in otherwise inaccessible spots. Applications include measuring of fuel oil flow, cooling water flow to electronic equipment or air compressors, and determining flow for Batch feeding systems.

More information? Circle Item 54, postcard, last page.

Expansion Compensator

An expansion compensator, called Line-Flex, is announced by Techniflex Division, Port Jervis, N. Y. For wet heat installation, it combines a streamlined design and permanent, silver-soldered, trouble-free joints.

There are no gaskets, O-rings, or other parts that can wear, it is pointed out, while its heavy-duty bellows



is completely enclosed. Use of the unit is said to eliminate noise, broken piping, and other damage caused by periodic expansion and contraction.

According to the manufacturer, the compensator is easily installed by soldering male and female end fittings into the line. Units are available in copper water tube sizes from ½ to 2 inches.

More information? Circle Item 55, postcard, last page.

(Continued on page 124)

YOUR IDEAS WORK BETTER WHEN YOU WORK WITH HONEYWELL

THE FOLLOWING PAGES bring you some of the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each staffed with control specialists to assist you in preparing proposals and writing specifications.

Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

EXAMPLE: Announcing Honeywell's New Electronic Air Cleaner Line . . .

THE SELECTOR SERIES!

This Selector Series of Electronic Air Cleaners now offers you a choice of three cell designs to match exact job requirements.

Hi Velocity Cell ¼ inch plate interval. Provides air cleaning efficiency of 95 per cent at an air velocity of 700 fpm. Specified when maximum cleaning is desired, when high velocities are encountered, or where installation space is limited.

AC/ME Cell 5/16 inch plate interval. Offers advanced capacity for dirt loading and maximum cleaning efficiency at moderate air flow rates. Ninety per cent efficiency at 600 fpm.

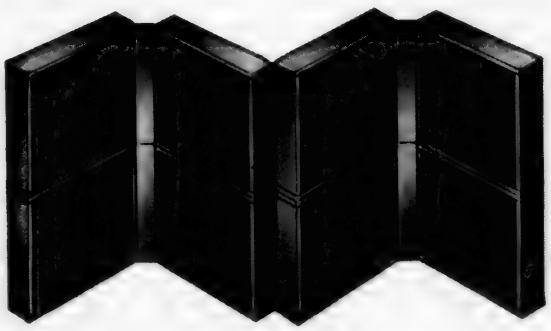
Hi-Load Cell ⅜ inch plate interval. Designed to provide greater capacity for dirt loading, less frequent washing. Rating of 90 per cent efficiency at 420 fpm.

Six times more efficient than mechanical filters, Honeywell Electronic Air Cleaners eliminate airborne dirt from the air conditioning system, trapping particles even as small as .001 microns.

A completely new washer has pliable nozzles that flutter as the water passes through giving faster, more efficient washing. The wash mechanism has been simplified and rearranged for smoother operation, less maintenance and less restriction to the air stream.

All Honeywell Electronic Air Cleaners are designed in building block modules. The frame is eliminated on field assembled units and simple button type connectors replace the old electrical connections. They offer the simplest, quickest installation available.

For the ultimate in pure air, specify Honeywell Activated Charcoal Filters with your Electronic Air Cleaner



Add Honeywell Activated Charcoal Filters to your Electronic Air Cleaner and you have the finest air cleaning system available. The Electronic Air Cleaner removes the dirt. The Activated Charcoal Filters remove the odors. And they help each other do a better job. For instance, the Electronic Air Cleaner, by removing dirt efficiently, prevents the charcoal filter pores from becoming clogged. They last longer without reactivation, work better.

Activated Charcoal Filters pay for themselves in reduced air conditioning costs because they reduce the amount of outdoor air required to dilute odor. And with Honeywell's new V shaped arrangement of building block modules, more charcoal filters can be put into the air stream without sacrificing easy access for reactivation.

For more information about Honeywell Electronic Air Cleaners or Activated Charcoal Filters, call your local Honeywell office. Or write Honeywell, Dept. HV-2-32, Minneapolis 8, Minnesota.

Honeywell

H HONEYWELL First in Control

FOR MORE TO WORK WITH WORK WITH HONEYWELL

EXAMPLE: From Honeywell's exact pneumatic

Single seated pneumatic valve

3-way pneumatic valve

This new line of Honeywell Pneumatic valves gives you superior performance characteristics, sharply upgraded ratings

BECAUSE valves supply the final control for over 90% of all temperature control systems, Honeywell has concentrated increasingly on the engineering of more dependable valves.

This newest line of Honeywell Pneumatic valves comes from four years of research, design and testing—an intensive development program which has produced a series of valves that set new industry standards for reliability and performance.

New valves provide wider limits of rangeability! These new valves provide accurate control of flow from the fully open position to the critical, hard-to-control light load situation. This has been made possible by these advanced design concepts:

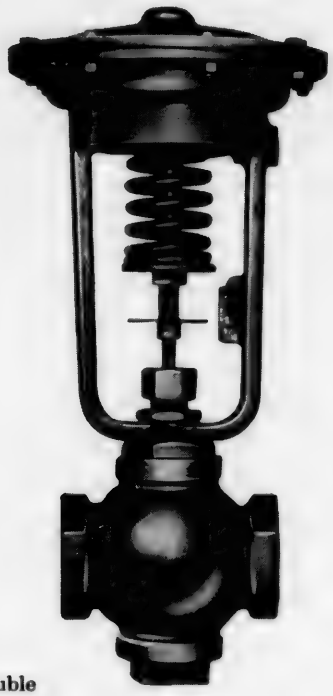
- A contoured plug or "characterized" V-port, precision made, provides a gradually-increasing rate of flow, giving far more sensitive fluid control.
- "Positive positioning"—made possible by the check-and-balance principle of the unique Honeywell Gradutrol relay. It assures accurate stem positioning regardless of changes in pressu differential.

They're designed for minimum maintenanc Precision design eliminates friction. Critical pa are made of durable, wear-resistant materials Neoprene motor diaphragm, stainless steel ste teflon packing, composition disc.

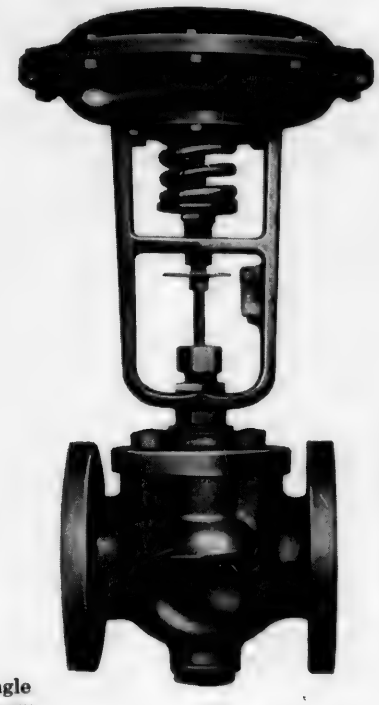
If repair is ever required, valve design perm fast, convenient parts replacement. For examp in most models the yoke can be removed to place valve stem, packing, disc or seat witho removing the valve from the line.

Honeywell Pneumatic valves are available i wide variety of types and sizes—one to meet yo exact requirement. Your Honeywell control sp cialist will supply you with complete specifi tions for the entire line, supply you with valua assistance in choosing the valve to order. Call h at your local Honeywell office or write Honeyw Dept. HV-2-32, Minneapolis 8, Minnesota.

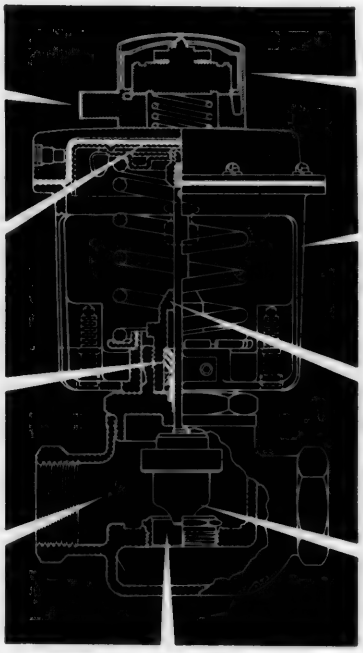
s complete line . . . the
valve to match your application



Series 400 double seated diaphragm valve



Series 400 single seated diaphragm valve



Air Connection Rotates 360° with Actuator.

Replaceable, Sensitive Roll Type Diaphragm.

Teflon Packings are Spring-Loaded and Self-Adjusting.

Large Flow Chamber Permits Higher Capacity.

Gradutrol Relay Insures Positive Positioning of Valve Stem.

2-Piece Yoke Simplifies Maintenance

Sliding Stem Retainer for Simpler Installation

Contoured Plug Insures Equal Percentage Flow at All Load Levels.

Seat Can Be Replaced without Removing Valve From Line.

JACK HAMMER FAILS TO FLAKE INLAND TI-CO®

Crumbling concrete is easy with this powerful paving breaker. It hits with crunching impact at the rate of 1,200 blows per minute with 75,000 ft. lbs. of developed energy. Yet, while thousands of repeated blows actually hammered this TI-CO galvanized sheet into the ground at the point of contact, there wasn't a trace of flaking of the zinc coating!

TI-CO won't flake or peel on the job, either. It's soft enough to take the most complicated forming, and when you hammer it flat it doesn't spring back—it stays flat!

TI-CO sheets take Pittsburgh lock-seaming or any other tough fabricating process without your worrying about make-overs. You get a good-looking, long-lasting installation . . . every time!

Ask your Steel Service Center for the TI-CO Brand . . . the galvanized sheet that's tailor-made for sheet metal work.

INLAND TI-CO

AMERICAN STEEL WAREHOUSE ASS'N

INLAND STEEL COMPANY

30 West Monroe Street · Chicago 3, Illinois

(Continued from page 120)

Dehumidifying Units in New Models

Niagara Blower Co., New York, N. Y., announces new models of the company's Controlled Humidity Method dehumidifying units. With this equipment, moisture is removed directly from atmospheric air by means of a liquid absorbent sprayed in the air stream. The temperature of this spray, in contact with the air, determines the dry bulb temperature of the air leaving the conditioning unit. The concentration of the absorbent liquid spray controls the air's dew point temperature, thus fixing its relative humidity. In this way full automatic control of the temperature and relative humidity of the conditioned air is secured by thermostats, no moisture-sensitive instruments being required.

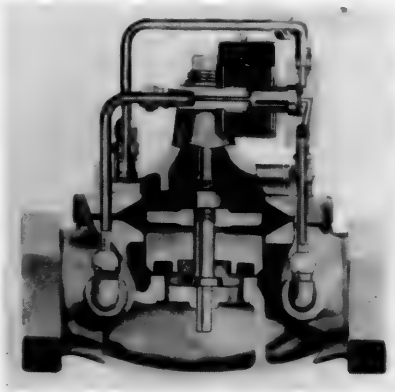
The necessary concentration of the absorbent is obtained by continuously cycling the diluted absorbent through a concentrating unit that removes the water from the system at the same rate in which it is taken up by the concentrator.

More information? Circle Item 56, postcard, last page.

Solenoid Control Valve

A solenoid control valve is announced by Cla-Val Co., Newport Beach, Calif. It is a pilot operated diaphragm actuated globe or angle valve and operates automatically on pressure from the line or independent supply, pneumatic or hydraulic.

Valve may be installed either vertically or horizontally. Pressure rating is 160 psi on a-c, or 100 psi on d-c current. Offered in 1 to 3 inch screwed, 1 to 4 inch



flanged. Resilient discs in both main valve and solenoid are said to assure drip-tight closing. Diaphragm is fully supported for long life, and the valve is packless, requiring no lubrication. Two basic types, energized to open and de-energized to open, may be equipped for control of opening speed or closing speed, or both.

Low power consumption is featured: 10.5 watts on a-c. 10 watts on d-c.

More information? Circle Item 57, postcard, last page.

(Concluded on page 126)

Major Oil Company SPECIFIED THERMAL

Two big Thermal central plant units were specified by a major oil company with headquarters in Houston for the year-round air conditioning of its Data Processing System. This same company has many other installations of Thermal air conditioning equipment in its several plants and office facilities.

The Thermal line includes central plant air conditioners; multi-zone air conditioners, sprayed coil units; heating and ventilating units, cooling and heating coils and air-cooled condensers. For air conditioning and ventilating equipment that can be relied on for efficiency, long life and economical operation, see your Thermal Engineering agent.

Agents in principal cities.
Quality Products Since 1945.

THERMAL ENGINEERING CORPORATION

2605 W. DALLAS • P. O. BOX 13254
HOUSTON 19, TEXAS

adaptability

When you design with Reznor duct furnaces, you don't have to adapt a heating system to the rigid limits imposed by packaged heating equipment. Reznor duct furnaces give you complete freedom to tailor the heating system to exact job requirements. Reznor gives you a compact, highly efficient heat exchanger with a full complement of combustion controls. You specify all other components to give each client just what he needs and wants in the way of heating and cooling.

ADAPTABILITY to your best designs is just one of many advantages of Reznor gas-fired duct furnaces. Ask your Reznor distributor for the complete story or write for your free copy of "Modern Heating".

Look for Reznor under Heaters-Unit in the Yellow Pages

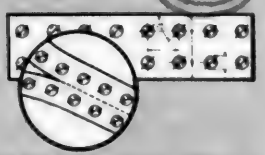
REZNOR
WORLD'S LARGEST SELLING DIRECT FIRED
UNIT HEATERS

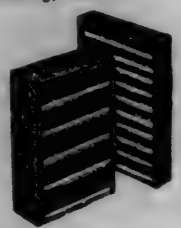
Reznor Manufacturing Company, 64 Union Street, Mercer, Pa.

Another CAINS COIL OF PROFIT

LOUVERAIL

ELIMINATES
Layout—Tab Cutting, Hole Punching, Riveting, Spot Welding, Etc.





Split (1½) Rail for Louver thicknesses from 1¼ to 1¾". Use Full Size Rail for Louver thickness from 3¼" to 4".

Try this economical and practical method for fabricating Louvers — removable, hinged, or stationary. Louverail is 24 ga. galv. 4½" wide in (2—50' lengths) 1 right and 1 left coiled together. Hundreds of variations possible.

Union Made

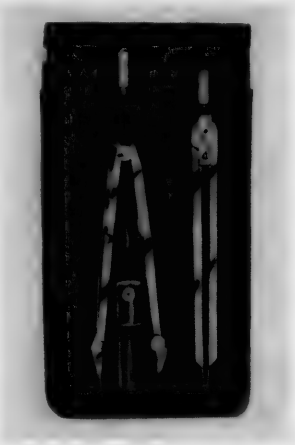
SOLD ONLY THROUGH JOBBERS AND DISTRIBUTORS
Some Territories Open for Manufacturers Agents Calling on Jobbers and Distributors

CAIN MANUFACTURING CO.
1111 North 5th Avenue Phone FA 2-0354 Birmingham Alabama

(Concluded from page 124)

Pocket Drawing Kit

An all-around, basic drawing kit is announced by Alvin & Co., Inc., Windsor, Conn., designed to be carried in a pocket for finger-tip availability in classroom, general shop, or drafting department. The kit contains a full 6-inch bow compass and a 5½-inch friction divider, sturdily constructed with polished nickel finishes.



Instruments, with spare parts tube and an extra divider needle, come in an attractive vinyl plastic case with a black satin finish. This 6¼ by 3½-inch case is fitted with a pocket flap. All-around double stitching is said to assure added protection against wear. A convenient pocket in the rear of the case provides additional storage for cards, pencils, pocket scales, and rules. Price is under four dollars.

More information? Circle Item 58, postcard, last page.

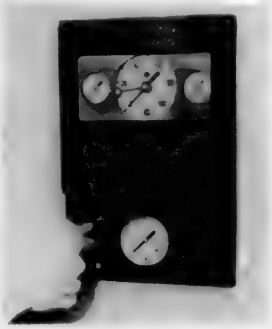
High-Recovery Units

Two larger Hi-Recovery water heaters, No. 70G, glass lined, with 180 gal per hr at 100-deg F. rise; and No. 65, copperlined, with 180 gal per hr at 100-deg rise are announced by Quiet Automatic Burner Corp., Newark, N. J. Tanks may be connected in multiple to supply any demand for hot water.

More information? Circle Item 59, postcard, last page.

Four-Position Control By-Pass

For use with the company's line of indicating pneumatic controllers, a 4-position Control By-Pass is announced by U. S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa.



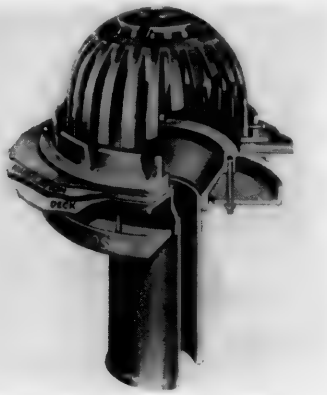
The unit is offered as an option with the company's Pilot controller which can be used for control of temperature, pressure, liquid level and other process variables. Its prime function is to give the plant operator a ready means for cutting off controller air to the valve (or damper, etc.) and for positioning the valve manually. A plant may require such manual process control, temporarily for the following reasons: On process start-ups where the controlled variable (temperature, pressure, etc.) must be carefully raised to the automatic control point; when unusual process upsets require manual rebalancing of a process; or when the controller must be adjusted, serviced, or removed to the repair shop.

As shown in photo, the Control By-Pass mounts directly below the indicating controller, forming an integral unit which measures only 8½ inches wide by 11½ inches high. For locally mounted installations, this combination offers a very economical and compact means of obtaining automatic control with a four-position by-pass. The assembly can be yoke-mounted on a diaphragm motor valve, where it provides the dual function of controller and manual operator for the valve.

More information? Circle Item 60, postcard, last page.

When Debris Collects on Roof

A new drain for use on flat roofs of any construction where excess waterway is necessary because of large amounts of debris collecting on the roof is offered by Josam Mfg. Co., Michigan City, Ind. Design features permit ample drainage even though a portion of the dome becomes obstructed by leaves, paper or similar objects.



The new Series No. 4780-DZL roof drains have a 12-inch long spigot adaptor which allows sufficient space to caulk the last joint below the ceiling line.

A 2-inch water collar retards the flow of water into the roof drain until the water level reaches 2 inches above the deck. One-inch deep notches in the 2-inch gravel stop prevents gravel from being washed into the drain and at the same time dams the water to the 1-inch level.

More information? Circle Item 61, postcard, last page.

Porous Bronze Nozzle Filter

Eddington Metal Specialty Co., Eddington, Pa., announces a one-piece porous bronze nozzle filter said to assure fool-proof flow of pure, filtered fuel oil and guaranteed nozzle operation. It provides more effective filtering than 200 mesh wirecloth strainers, lasts longer and is harder to contaminate than wirecloth strainers, the company states. It is designed to improve nozzle protection for all small sizes from 0.50 to 2.00 gpm.

More information? Circle Item 62, postcard, last page.

Bryant Manufacturing gets superior thermal and acoustical insulation with Pittsburgh Superfine Fiber Glass

HERE'S HOW BRYANT USES SUPERFINE IN ASSEMBLY LINE OPERATION...

1. Light-weight Pittsburgh Superfine is cut on an ordinary paper-type cutter to the correct panel size. No complicated equipment is needed. Superfine is ideal for fast, easy assembly line production methods.

2. Worker applies adhesive to panel with an ordinary roller in preparation for Superfine mounting. Bryant uses Pittsburgh Superfine Fiber Glass on four boiler models, five gas furnace models and two oil furnaces.

3. Pre-cut section of Pittsburgh Superfine is placed in panel, providing superior thermal and acoustical performance in the end product. Reflective properties of the Superfine's foil facing improve efficiency of the heating unit.

Mr. William M. Day, Vice President of Bryant Manufacturing Company, Indianapolis, Indiana, reports, "Besides passing our own rigid inspection standards, Pittsburgh Superfine has been tested and approved as an integral part of our products by the American Gas Association and Underwriters' Laboratory, Inc. We take no chances with the quality of our products, and that goes for the materials we put in them, too."

TAKE YOUR CHOICE OF SUPERFINE IN A VARIETY OF FACINGS

You can get top-quality Pittsburgh Superfine Fiber Glass Insulation in a wide variety of facings, each one designed for a specific application. For complete information, write to Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

PITTSBURGH SUPERFINE IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh and St. Louis

FIBER PG GLASS PITTSBURGH PLATE GLASS COMPANY

PRODUCT APPLICATIONS

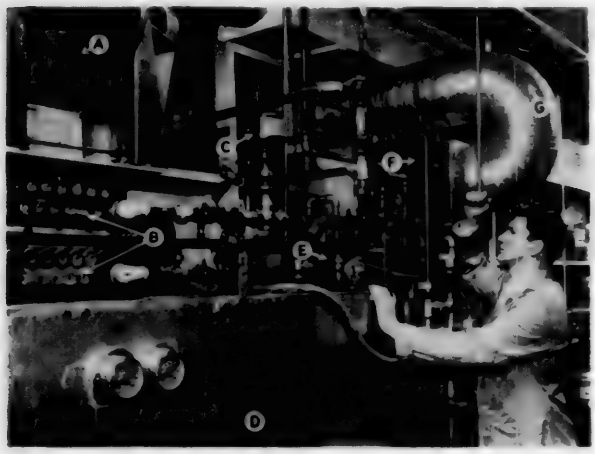
New, Unusual, or Ingenious Uses of Equipment and Materials

Company Constructs Conditioning Chamber For Paper Winding Process

Static electricity and curling during the rapid winding of photographic material onto rolls were problems encountered by Grant Photo Products, Inc., Lakewood, Ohio, maker of photographic films and papers. Sparks generated by static electricity from rapid winding in a dry room tended to ruin the material and create a fire hazard; dry air also made the material curl, creating a nuisance when material was being wound.

Jacob Jordan, chief engineer, believes that the combination preheater and tank humidifier built by the company to control temperature and humidity in the winding chamber is unique because it can change and precisely maintain the conditions at a moment's notice. A wide range of humidities and temperatures, from 55 to 99% rh, and from 80 to 120 deg F, is necessary because various materials wound in the chamber react differently to a given air condition. For example, the harder the material being wound, the higher the temperature in the winding chamber must be in order to drive the proper amount of moisture into the material. Materials range from extremely hard acetates to very soft paper.

The winding chamber is 25 ft long, 8 ft wide, and 10 ft high. Freshly coated and dried material, hung on



chain-driven wooden racks, enters the chamber through an opening after having passed through a drying chamber 175 ft long. Although the opening is 48 inches wide and 6 ft high, the material draped over the racks acts as a curtain as it enters the chamber, and the leakage of the recirculating air is negligible.

As shown in photo, air at the rate of 1500 cfm is sucked from the winding chamber by a fan located in the intake duct (a) into the preheater (b). A self-operating regulator (c), manufactured by The Powers Regulator Co., Skokie, Ill., and located on the 20 psi steam line supplying the preheater, maintains the air passing from the preheater into the humidifier tank (d) at a constant temperature. The regulator's thermal bulb is located inside the tank immediately below the preheater. Air passes through the tank, picking up moisture from evaporating water maintained at a 1-ft level at the bottom of the tank, and from a mist created by 100 mist nozzles on eight vertical pipes within the tank. A water pump (e) forces water at 30 psi from the bottom of the tank up through the mist nozzles. Another self-operating regular (f), being adjusted by the operator, is located on the steam line supplying the heating coils at the bottom of the tank, and maintains the water within the tank at a constant temperature; this regulator's thermal bulb is in the water at the tank bottom. After picking up moisture, air passes through the exhaust duct (g) and into the conditioning chamber. It is then recirculated.

Tests were carried out after the entire installation was completed to find the right combination of adjustments on the two regulators to produce a given air condition in the chamber. The operator has a chart which shows the proper adjustments for a particular material.

Thermostat in Refrigeration System Regulates Rink's Ice Temperature

A modulating thermostat for precise temperature control is a unique feature of the refrigeration system recently installed in the new indoor ice skating rink at West Orange, N. J.

The Arthur E. Magher Co., Inc., of New York City, mechanical contractors for the installation, realized the importance of very close control of ice temperature so that varying ideal ice surface temperatures for hockey, figure skating and public skating could be met regardless of temperature, humidity, number of skaters and number of spectators. The ideal temperature for hockey is 26 deg F, for figure skating, 27 deg, and for public skating, 28 deg, with a 45-deg wet bulb. To accomplish this control, two Worthington freon compressors were arranged so that by unloading half the cylinders of each, the capacity could be varied from a full 140 tons of refrigeration to 105 tons, 70 tons, 35 tons and 0 tons.

The capacity variations are regulated by a modulating thermostat with an adjustable differential and motor driven step control enabling the brine temperature to be held as close as ½ deg F. Such close control is maintained that the recording thermometers show practically no variations in the brine temperature. Most rinks have one or, at most, two snap-action thermostats that, in consequence, operate over quite a range of temperature even when frequently adjusted. The amount of brine circulated is large in order to insure that the rise in temperature through the rink piping is never over three degrees, and is usually not over 1½ deg. With the close centers of the pipes, the entire surface temperature of the ice is constant and may be held at the proper level.

Engineers were Peter Carver Associates, New York City; architect was E. Nelson Edwards, Philadelphia, Pa.

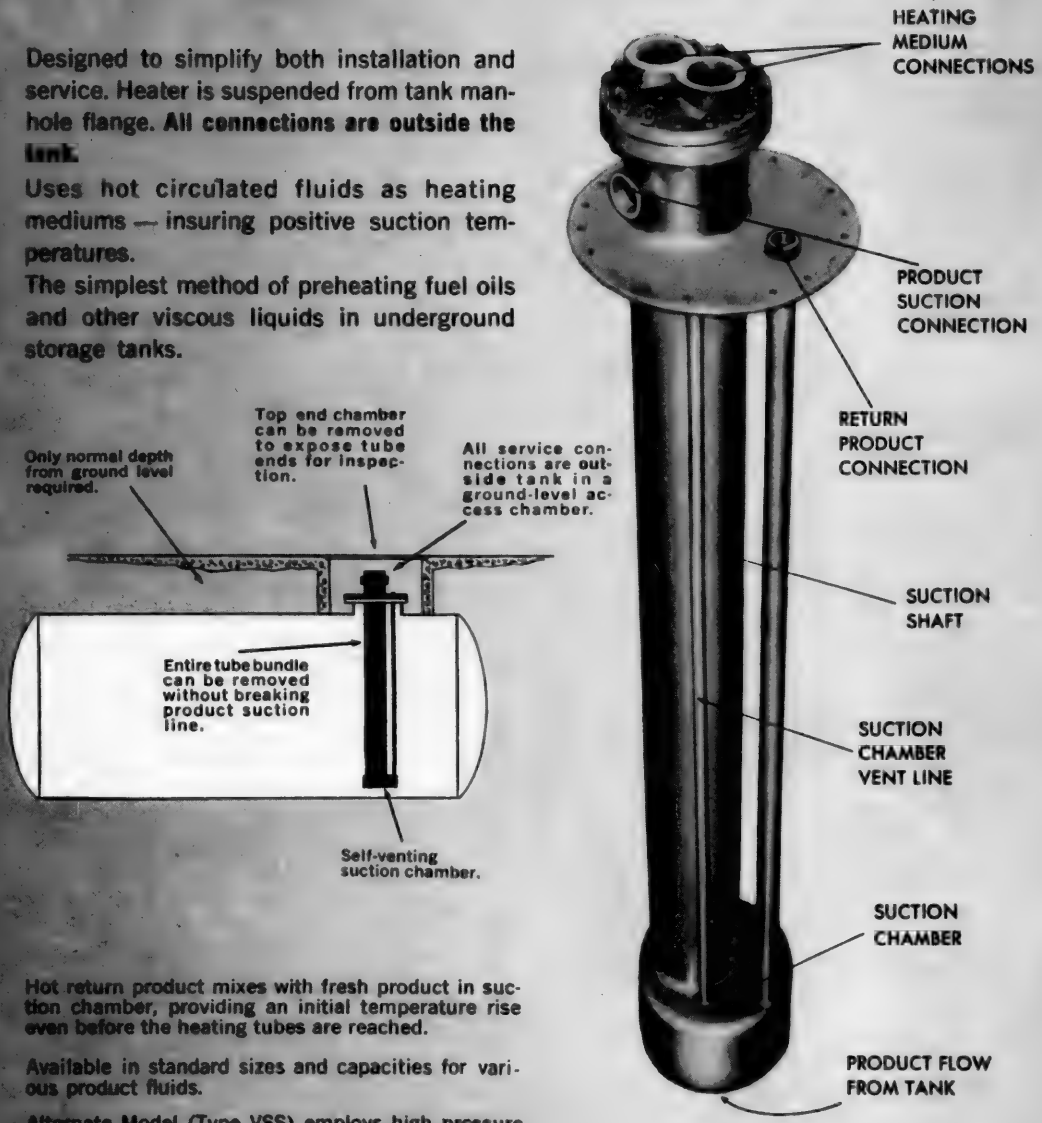
NOW... for underground fuel oil storage tanks—
a tank suction heater with easily accessible service connections

PARACOIL "VUF"
VERTICAL TANK SUCTION HEATER

Designed to simplify both installation and service. Heater is suspended from tank manhole flange. **All connections are outside the tank.**

Uses hot circulated fluids as heating mediums — insuring positive suction temperatures.

The simplest method of preheating fuel oils and other viscous liquids in underground storage tanks.


HEATING MEDIUM CONNECTIONS
PRODUCT SUCTION CONNECTION
RETURN PRODUCT CONNECTION
SUCTION SHAFT
SUCTION CHAMBER VENT LINE
SUCTION CHAMBER
PRODUCT FLOW FROM TANK
Only normal depth from ground level required.
Top end chamber can be removed to expose tube ends for inspection.
All service connections are outside tank in a ground-level access chamber.
Entire tube bundle can be removed without breaking product suction line.
Self-venting suction chamber.

Hot return product mixes with fresh product in suction chamber, providing an initial temperature rise even before the heating tubes are reached.

Available in standard sizes and capacities for various product fluids.

Alternate Model (Type VSS) employs high pressure steam as the heating medium.

Write for Bulletin 60-J1

DAVIS ENGINEERING CORPORATION

30 Rockefeller Plaza, New York 20, New York • Circle 6-5650

DEGREE-DAYS FOR DECEMBER, 1958

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 31st Year of Publication of Monthly Degree-Day Data

City	December			Season to Dec. 31, incl., from Sept. 1		
	1958	1957	Normal	1958	1957	Normal
Abilene, Texas (A)	690	466	595	1148	1100	1098
Albany, New York (A)	1415	981	1197	2801	2274	2559
Albuquerque, New Mexico (A)	722	817	899	1568	1829	1575
Alpena, Michigan (C)	1447	1120	1218	2903	2745	2827
Asheville, North Carolina (C)	860	731	769	1642	1698	1633
Atlanta, Georgia (A)	681	560	614	1066	1138	1125
Atlantic City, New Jersey (A)	1132	699	831	2005	1424	1597
Augusta, Georgia (A)	667	528	494	1041	999	835
Baltimore, Maryland (C)	988	708	812	1701	1393	1537
Billings, Montana (A)	1116	856	1172	2530	2583	2739
Binghamton, New York (C)	1367	936	1113	2696	2230	2417
Birmingham, Alabama (A)	711	520	596	1137	1105	1128
Bismarck, North Dakota (A)	1621	1257	1535	3407	3138	3458
Block Island, Rhode Island (A)	1070	714	927	2060	1588	1936
Boise, Idaho (A)	870	940	1054	2047	2325	2340
Boston, Massachusetts (A)	1190	766	998	2207	1669	2008
Buffalo, New York (A)	1318	930	1116	2525	2243	2424
Burlington, Iowa (A)	1289	970	1150	2323	2257	2334
Burlington, Vermont (A)	1603	1092	1308	3147	2528	2859
Cairo, Illinois (C)	941	628	784	1543	1362	1465
Charleston, South Carolina (C)	502	404	410	682	676	658
Charlotte, North Carolina (A)	783	611	682	1294	1238	1274
Chattanooga, Tennessee (A)	819	657	710	1404	1374	1380
Cheyenne, Wyoming (A)	1052	923	1125	2571	2809	2840
Chicago, Illinois (A)	1315	941	1147	2296	2163	2352
Cincinnati, Ohio (C)	1064	723	880	1774	1588	1711
Cleveland, Ohio (A)	1288	891	1057	2298	2047	2171
Columbia, Missouri (A)	1065	797	989	1853	1852	1967
Columbia, South Carolina (A)	702	526	524	1102	993	908
Columbus, Ohio (C)	1255	846	983	2209	1917	1995
Concord, New Hampshire (A)	1459	990	1271	2996	2353	2839
Concordia, Kansas (C)	1067	812	1029	1938	1975	2048
Dallas, Texas (A)	634	363	518	937	861	870
Dayton, Ohio (A)	(a)	882	1032	(a)	2058	2122
Denver, Colorado (A)	898	782	1032	2070	2181	2348
Des Moines, Iowa (A)	1294	1018	1203	2369	2457	2455
Detroit, Michigan (A)	1313	952	1101	2391	2227	2325
Devils Lake, North Dakota (C)	1761	1428	1668	3766	3557	3795
Dodge City, Kansas (A)	1003	748	980	1914	1896	1951
Dubuque, Iowa (A)	1490	1111	1290	2774	2712	2765
Duluth, Minnesota (C)	1808	1465	1550	3760	3585	3533
Elkins, West Virginia (A)	1209	897	995	2460	2243	2255
El Paso, Texas (A)	549	570	626	928	1173	1086
Ely, Nevada (A)	958	1058	1181	2621	3041	2864
Escanaba, Michigan (C)	1519	1227	1321	3068	2980	3056
Evansville, Indiana (A)	1103	727	871	1927	1703	1715
Fargo, North Dakota (A)	1684	1343	1615	3406	3259	3538
Fort Smith, Arkansas (A)	826	559	698	1341	1218	1273
Fort Wayne, Indiana (A)	1366	942	1122	2506	2303	2365
Fort Worth, Texas (A)	659	410	533	988	956	890
Fresno, California (A)	470	604	580	806	1069	1011
Galveston, Texas (C)	339	175	271	476	369	402
Grand Junction, Colorado (A)	899	1032	1132	1965	2281	2293
Grand Rapids, Michigan (A)	1373	1039	1169	2620	2538	2597
Green Bay, Wisconsin (A)	1543	1232	1392	3030	2993	3035
Greensboro, North Carolina (A)	912	693	772	1610	1517	1513
Greenville, South Carolina (A)	734	613	648	1186	1258	1200
Harrisburg, Pennsylvania (A)	1177	855	964	2171	1900	1971
Hartford, Connecticut (A)	1285	876	1082	2543	2019	2266
Havre, Montana (C)	1312	960	1383	3067	2842	3240
Helena, Montana (A)	1253	998	1311	3095	2976	3247
Houston, Texas (C)	363	205	303	544	451	465
Huron, South Dakota (A)	1500	1118	1407	2938	2760	3003
Indianapolis, Indiana (A)	1257	888	1051	2292	2114	2141
Jackson, Mississippi (A)	632	449	503	991	916	882
Kansas City, Missouri (A)	1016	783	970	1672	1765	1875
Knoxville, Tennessee (A)	846	648	744	1432	1363	1454
La Crosse, Wisconsin (A)	1515	1189	1380	2800	2793	2900
Lander, Wyoming (A)	1192	1111	1383	2862	3152	3309
Lewiston, Maine (O)	1435	1051	1295	3023	2477	2837

(a) Data not available.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 132]

Degree-Days for December, 1958 (Concluded)

NEW!

SII-vector
RADIATION

"Custom fits" without cutting . . .
Slashes installation time & expense

Standardized sections up to 4' lengths. Accessories for unusual building contours. Finned tubes mounted and adjusted to required pitch in seconds on sliding cradle hangers. Elements packaged individually for easy handling. Write, wire or phone . . .

radiant-ray BRAND

radiant-ray radiation, inc.
newington, connecticut

for your convenience / ***SPRAY NOZZLES***
and all related accessories for
HUMIDIFYING / *from a single, dependable source*

PRECISION PNEUMATIC ATOMIZING NOZZLES

ACCESSORIES SUCH AS AIR FILTERS, HUMIDISTATS, SOLENOID VALVES, PRESSURE REGULATORS

COMPACT HUMIDIFYING UNITS

For industrial installations of every size Spraying Systems offers all needed equipment . . . everything but the piping, wiring and compressor. Provides high efficiency, dependable system; only two components have moving parts. Engineered for easy installation and simplified maintenance.

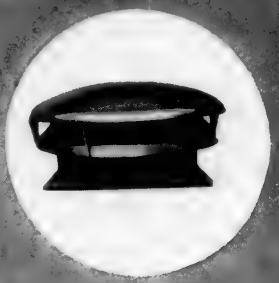
WRITE FOR Bulletin 82 . . . spray nozzles, assemblies and parts for manual or automatic humidifying systems.

ALSO SUPPLIED . . . spray nozzles for evaporative condensers, air washers, cooling towers, spray ponds and roof cooling systems.

SPRAYING SYSTEMS CO.
3261 RANDOLPH STREET • BELLWOOD, ILLINOIS
ADVANCED SPRAY NOZZLE DESIGN FOR NEW DIMENSIONS IN CONTROL AND PERFORMANCE

ACCEPTED *Allen*
ROOF VENTILATION

Whatever your ventilating needs, be sure to see how Allen equipment can meet your requirements efficiently and economically.



NEW "I-LINE" for EYE APPEAL

The new "I-Line" provides an attractive low contour, assuring maximum capacity or efficiency with the minimum over-all height.

POWERFUL "VD" for HIGH VELOCITY

By moving a large volume of air at high velocity, this Vertical Discharge fan keeps fumes from sifting back into building.

Allen

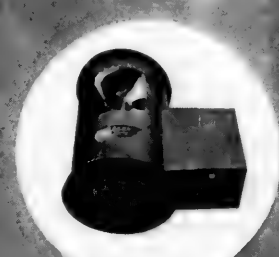
. . . is prepared to investigate ventilating problems and plan systems for the efficient removal of heat, fumes, vapor or dust.

WIND-DRIVEN TURBINES

Three types of Allen turbines take full advantage of the economy of natural air movement.

EXHAUST FANS

Remote drive Staxauster is designed to handle corrosive fumes, and/or high temperature air.



THE ALLEN LINE

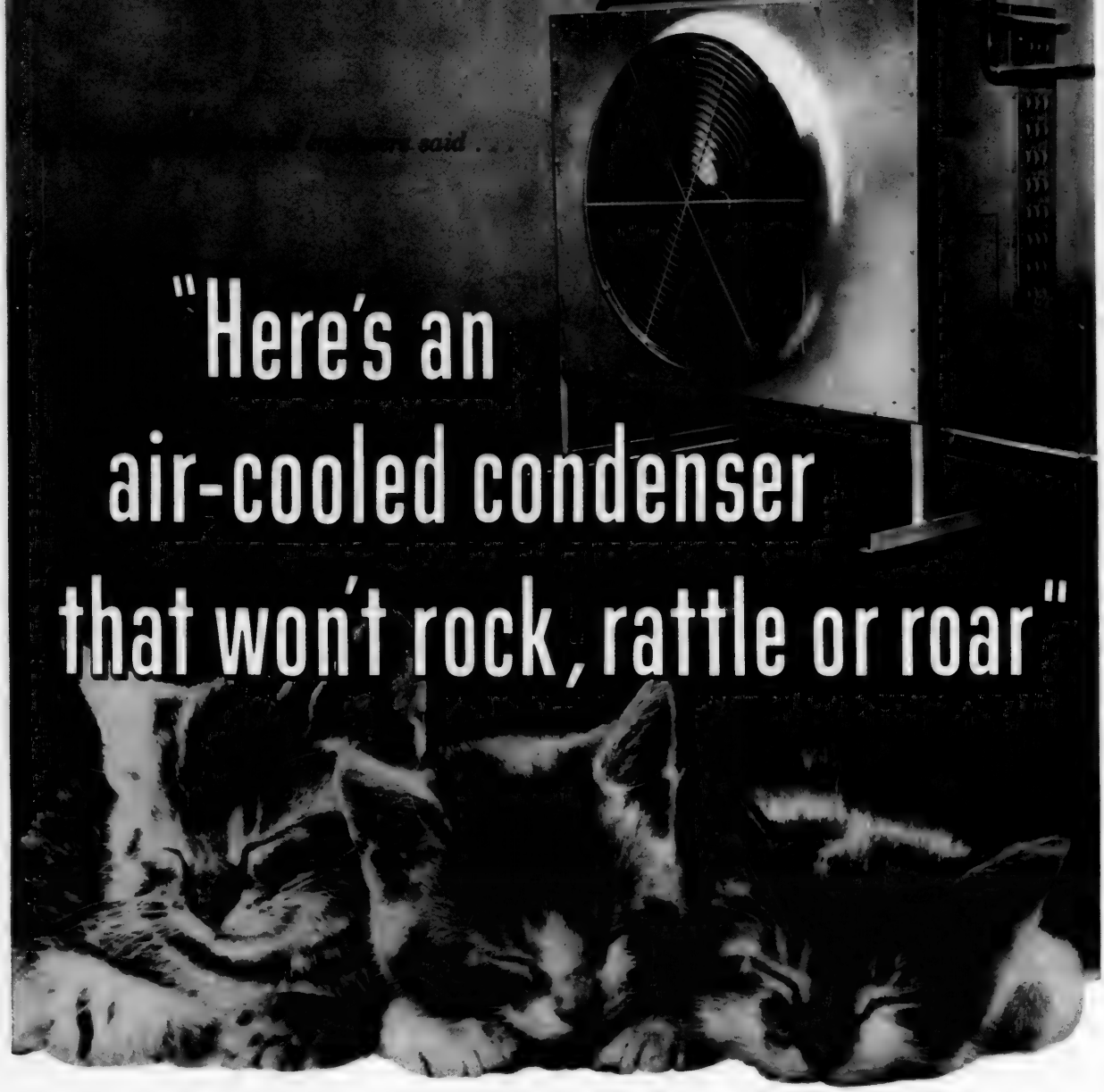
Write today for catalog that gives specifications and performance data on these and other units in the Allen ventilator line.

ALLEN
ALLEN COOLER & VENTILATOR, INC.
ROCHESTER, MICH.
Roof Ventilators for Every Commercial and Industrial Need
REPRESENTATIVES IN PRINCIPAL CITIES

City	December			Season to Dec. 31, incl., from Sept. 1		
	1958	1957	Normal	1958	1957	Normal
Lincoln, Nebraska (C)	1106	863	1113	2041	2141	2243
Little Rock, Arkansas (A)	755	487	654	1194	1029	1179
Los Angeles, California (C)	132	112	253	214	259	451
Louisville, Kentucky (A)	1040	712	871	1784	1627	1733
Lynchburg, Virginia (A)	964	728	809	1708	1646	1625
Macon, Georgia (A)	587	460	481	841	856	724
Madison, Wisconsin (A)	1499	1142	1287	2821	2757	2707
Marquette, Michigan (C)	1467	1218	1299	2995	2926	3011
Memphis, Tennessee (A)	795	526	673	1289	1130	1248
Meridian, Mississippi (A)	638	464	528	994	923	956
Milwaukee, Wisconsin (A)	1429	1087	1218	2678	2631	2611
Minneapolis, Minnesota (A)	1519	1226	1414	2868	2873	2990
Moline, Illinois (A)	1319	989	1181	2386	2392	2426
Montgomery, Alabama (A)	571	470	491	843	854	864
Nashville, Tennessee (A)	886	619	725	1509	1387	1372
New Haven, Connecticut (A)	1179	842	1026	2279	1855	2145
New Orleans, Louisiana (C)	353	232	283	477	436	429
New York, New York (C)	1073	749	908	1900	1528	1771
Newark, New Jersey	1103	796	961	1983	1634	1912
Norfolk, Virginia (A)	855	558	688	1276	1110	1257
North Platte, Nebraska (A)	1193	968	1172	2559	2435	2563
Oak Ridge, Tennessee (C)	875	673	812	1539	1371	2587
Oakland, California (A)	346	496	508	712	938	1077
Oklahoma City, Oklahoma (A)	876	631	747	1461	1483	1367
Omaha, Nebreska (A)	1184	921	1166	2186	2244	2368
Parkersburg, West Virginia (C)	1127	798	896	2028	1810	1824
Peoria, Illinois (A)	1296	949	1128	2294	2185	2312
Philadelphia, Pennsylvania (C)	1046	733	856	1851	1487	1624
Phoenix, Arizona (A)	271	303	360	399	568	555
Pittsburgh, Pennsylvania (C)	1179	808	924	2095	1834	1890
Pittsfield, Massachusetts (A)	1425	1010	1246	3015	2522	2845
Pocatello, Idaho (A)	937	1050	1184	2399	2786	2727
Portland, Maine (A)	1452	986	1237	3030	2359	2776
Portland, Oregon (C)	565	619	701	1339	1471	1600
Providence, Rhode Island (A)	1225	817	1035	2344	1854	2195
Pueblo, Colorado (A)	908	798	1051	1988	2027	2279
Raleigh, North Caroline (A)	865	619	651	1460	1349	1166
Rapid City, South Dakota (A)	1168	924	1218	2533	2542	2802
Reading, Pennsylvania (C)	1132	809	936	2070	1745	1866
Red Bluff, California (A)	352	618	564	678	1180	942
Reno, Nevada (A)	839	916	986	2153	2433	2338
Richmond, Virginia (A)	973	674	791	1618	1475	1532
Rochester, New York (A)	1344	948	1141	2612	2304	2473
Roswell, New Mexico (A)	753	655	750	1479	1488	1415
Sacramento, California (C)	377	578	567	656	1044	980
St. Joseph, Missouri (A)	1123	888	927	1987	2057	1809
St. Louis, Missouri (C)	1057	702	893	1692	1607	893
Salt Lake City, Utah (A)	887	971	1039	2081	2382	2279
San Antonio, Texas (A)	450	292	374	697	633	600
San Diego, California (A)	108	117	255	202	251	478
Sandusky, Ohio (C)	1323	886	1039	2303	2070	2116
San Francisco, California (C)	224	413	406	580	789	881
Sault Ste. Marie, Michigan (A)	1661	1271	1398	3417	3076	3340
Savannah, Georgia (A)	517	442	412	745	761	675
Scranton, Pennsylvania (A)	1316	966	1057	2647	2269	2254
Seattle, Washington (C)	541	581	679	1484	1505	1682
Sheridan, Wyoming (A)	1212	921	1271	2843	2781	3045
Shreveport, Louisiana (A)	621	384	490	967	809	848
Sioux City, Iowa (A)	1333	1003	1290	2512	2464	2708
Spokane, Washington (A)	1004	923	1113	2550	2518	2705
Springfield, Illinois (A)	1187	874	1017	2124	2059	1998
Springfield, Missouri (A)	994	693	908	1773	1686	1833
Syracuse, New York (A)	1408	949	1113	2675	2222	2340
Toledo, Ohio (A)	1354	944	1119	2519	2301	2364
Topeka, Kansas (C)	1078	786	977	1924	1823	1891
Trenton, New Jersey (C)	1105	794	930	2028	1658	1852
Tulsa, Oklahoma (A)	853	582	750	1362	1327	1382
Utica, New York (O)	1457	990	1144	2766	2308	2537
Valentine, Nebraska (A)	1273	993	1212	2706	2592	2709
Walla Walla, Washington (C)	813	696	890	1834	1857	1966
Washington, D. C. (C)	987	720	831	1669	1530	1604
Wichita, Kansas (A)	984	757	915	1715	1802	1763
Williston, North Dakota (C)	1508	1216	1528	3356	3134	3495
Winnemucca, Nevada (A)	890	983	1085	2340	2697	2595
Yakima, Washington (A)	964	914	1066	2429	2362	2469

For footnotes, see page 130.

NEWS OF THE MONTH



"Here's an air-cooled condenser that won't rock, rattle or roar"

They planned it that way. H&M Air-Cooled Condensers had to be free of the vibrations, rattles and fan noise that plagued so many competitive models. And comments from contractors and users prove they hit their target.

The extra rugged casing won't loosen with use. Lock-tight construction avoids annoying rattles. Four-bladed, deep pitch fans are driven at slow speed for really quiet operation.

Halstead & Mitchell condensers are dependable, too. Large coil and exclusive Turbu-Flo design add more surface, improve heat transfer by up to 15%. Wide fin spacing prevents condenser clogging by dirt or other air-borne particles.

Designed for use with Refrigerants 12 or 22, H&M Air-Cooled Condensers are available in twelve models, from 3 to 50 tons capacity. Floor or ceiling mountings. Multiple circuiting for specified requirements, at no extra cost. Centrifugal Fan models are available for inside installations requiring ductwork.

Ask for H&M Air-Cooled Condensers at your distributors, or write for literature. Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.

HM Halstead & Mitchell

Air-Cooled Condensers • Cooling Towers • Water-Cooled Condensers • Finned Coils

WATER CRISIS SEEN

within the next twenty years unless remedial steps are taken. Costs for converting sea water still high.

Within the next 20 years, the world will be faced with a massive critical water shortage problem unless immediate remedial steps are taken, Fred R. Loebel, president of Cleaver-Brooks Special Products, Waukesha, Wis., warned in a New York talk recently. The firm is a leading manufacturer of evaporation and distillation equipment.

In brief remarks at a special luncheon of Naval architects and engineers at the Waldorf-Astoria, Loebel said that estimated consumption of water in the United States alone will surpass 500 billion gallons daily by 1978, and that this continually increasing drain will result in a major decrease in local water reserves as well as exhaust supplies in some areas.

Water consumption for domestic and industrial use in the United States today averages between 250 billion and 265 billion gallons daily, according to government estimates. This anticipated doubling of consumption within the next 20 years is tied directly to estimated growth in both population and economy for this country, Loebel said.

The problem will not be confined to the U. S., Loebel cautioned. Many countries in the middle east are in particularly dire straits as far as fresh water sources are concerned. With limited rainfall, burgeoning populations and coast lines fronting on salt-bearing water bodies, they must turn to mechanization for the answer.

• **FLASH EVAPORATOR**— He said cost remains the big problem with most distillation equipment converting sea water to potable water. He added that his firm's new flash-type evaporator, where sea water is "flashed" into vapor under vacuum, can produce fresh water from the sea or deep wells for about $1 a thousand gallons, when all costs are included. He said that people are now paying about this much for water in some communities. Continuing research and development may drive these costs down even further, perhaps to $0.70 a thousand gallons in the near future, Loebel reported.

POWER CONFERENCE IN MARCH

to feature twenty-seven technical sessions, including one on space heating and 16 on power generation.

Nearly 90 papers will be presented at 27 technical sessions scheduled for the 21st annual American Power Conference to be held at the Hotel Sherman, Chicago, Ill., March 31 through April 2.

Eight sessions will be devoted to the mechanical aspects of power generation and eight to electrical aspects, according to Conference Director, R. A. Budenholzer, professor of mechanical engineering at Illinois Institute of Technology, Chicago 16, Ill., which is sponsoring the conference. In addition, there will be two sessions on nuclear power, two on hydroelectric power, five on water technology, one on space heating, as well as one general session.

Three luncheons, and an All Engineers dinner on April 1, will complete the three-day program.

The session topics include central station steam generators, operating experience with once-through boilers, large steam turbines, central station power plants, nuclear power plants, peaking service, industrial power plants, hydroelectric power, and water technology.

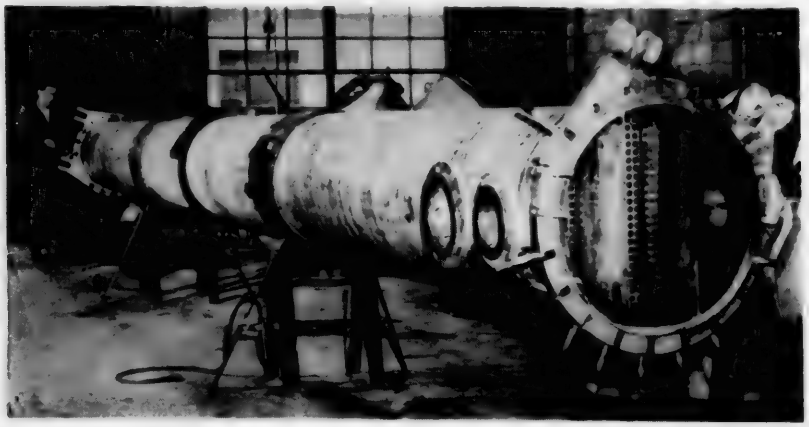
Others are feedwater circuit, fuels, space heating, extra-high-voltage transmission, cables, circuit breakers, incremental loading, network analyzers, distributions systems and industrial power systems.

PROTEST ATTITUDE

of New York City on engineering fee schedule. Consulting Engineers urge 2½ multiplier rule.

A resolution was passed by the New York Association of Consulting Engineers, New York City, urging the city to adopt the same fee formula for its construction as prevails in regular engineering practice. This followed the

(Continued on page 136)



When installed at Cannon Mills, Kannapolis, N. C., eight heat reclaimers (Similar to this one under construction at the Patterson-Kelley Company) will form the world's largest heat reclamation installation. The combined reclaimers, providing a total reclamation of 82.9 million BTU's per hour from waste process fluids, will recover enough heat to supply the domestic hot water needs for a city of 600,000 people for one day.

Wherever the four winds blow... this trademark stands for

matchless power exhauster performance

Here's why . . .

Jenn-Air developed the first spun aluminum, low contour exhauster years ago. This was a milestone in exhauster design, but it was by no means Jenn-Air's last word on the subject. Product improvement is a never-ending project at Jenn-Air, and this emphasis on engineering has netted rich dividends over the years. Examples of exclusive features developed by Jenn-Air include:

• **U-spring suspension**—Compensates for both radial and lateral movement to reduce vibration and noise. 44% more effective than rubber isolaters. Unconditionally guaranteed for life!

• **Integral balance**—In addition to dynamic and static balancing of blades, Jenn-Air exhausters feature *integral* balancing of blade with motor. This is an important contribution toward further noise reduction.

• **High point of discharge**—Motor is nested in the housing to provide the highest discharge point of any roof exhauster. By eliminating the need for a high curb base, this feature also makes possible Jenn-Air's attractive "low contour" design.

Every Jenn-Air exhauster that comes off the production line is individually tested for sound level, motor load and insulation breakdown. Only units which can pass these rigid tests are accepted for shipment. Air moving capacities range from 175 to 22,700 cfm and are AMCA-certified. Write for Bulletin 58-B.

JENN-AIR

Jenn-Air Products Co., Inc
1102 Stadium Drive
Indianapolis 7, Indiana

Member of Air Moving and Conditioning Association

fees committee's report of efforts throughout the year "to improve engineering fees for projects of the City of New York, in particular public schools," and that "progress has been slow and in large part disappointing."

The resolution stated, "An adequate fee for engineering services should be based on an amount equal to two and one-half times the net time card costs of the design staff engaged on the work. This formula is a well established one, is widely used in our private practice and has found a fairly general acceptance all over the country."

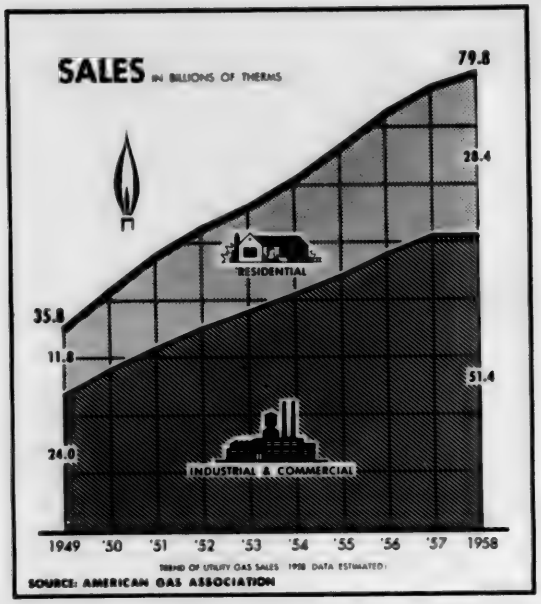
• **RESEARCH DONE**—In arriving at the recommendation, the committee said they "had obtained actual data from members as to drafting costs on both structural and mechanical projects for all types of public buildings." The data showed actual fees received and compared them with an adequate fee, based on 2½ times drafting costs.

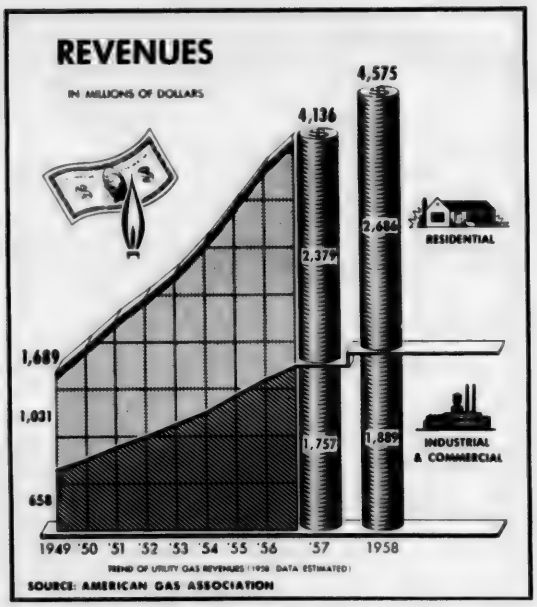
"Results for schools showed a rather remarkable uniformity. The figures for public works jobs presented no particular pattern, but proved quite clearly that public works fees are hopelessly inadequate."

The committee also reported they had conferred with the national associations of architects, civil engineers and others, and found that the fee schedules of those groups ranged from a multiplier of two and two-tenths for very large jobs to three for smaller jobs.

A letter stating these facts was sent to James D. Carroll, Chief Engineer of the city's Bureau of the Budget.

The NYACE represents the leading mechanical, electrical and structural engineers in New York City. Its members are largely responsible for the engineering design that goes into the major building construction in the city.





With a record-breaking 32 million customers and current annual sales of more than $4.5 billion, the gas utility and pipeline industry announces it will spend between $1.7 and $1.8 billion in 1959 for construction and development of gas transmission, distribution, and storage. Over 19 million househeating customers represent 64.7% of all residential gas customers. As seen in the graph at top, industrial and commercial users account for over 64% of all gas consumed. As seen in the graph below, however, the residential market continues to lead in revenues.

HEAT PUMP

wins support of Philadelphia utility company. Economics of two large installations discussed.

The favorable economics of two large heat pump installations in the Philadelphia area were outlined at a Customer Forum on the attitudes of electric utility companies toward the heat pump held by York Div., Borg Warner Corp., at York, Pa. The guest speaker, representing the power companies, was Arnold D. Spillman, manager of Sales Application Department, Philadelphia Electric Company, which sells electricity, gas, and steam service.

The first installation, at Levittown Shopping Center, uses small package heat pumps totalling 432 tons of refrigeration. Operation cost comparisons showed that the heat pumps compared favorably with oil heat in the area as long as the price of oil averaged about 13.5 cents per gallon.

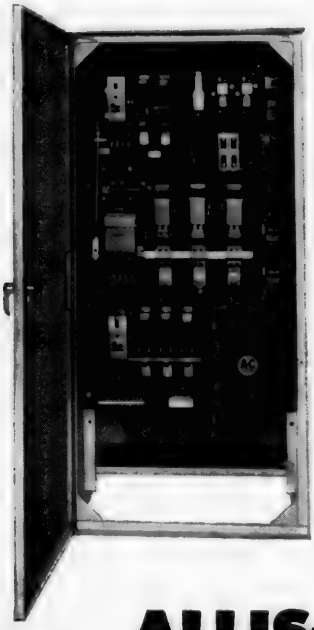
The heat pumps in this installation use resistance heating for auxiliary heat during low winter temperatures. These auxiliary heaters come on during the coldest periods when the power company's demand is at its highest peak. Mr. Spillman pointed out that the utilities prefer a two-stage heat pump, such as York installed at the Ballinger Company in Philadelphia.

• **NIGHT SET-BACK DISCOURAGED**—Data gathered at the Ballinger Company over the past two years by Philadelphia Electric has proven that a night set-back (from 72 to 65 deg F) was not financially advantageous. Using night set-back, the yearly bill for total electrical usage was approximately $1700. During January and February, the demand went to 175 kw in the morning when

(Concluded on page 150)

Rugged* Simplicity

in air-conditioning motor starters



Simple, durable contactors assure continuous service

ONE look reveals the clean, balanced design of Allis-Chalmers contactors. Fewer parts eliminate many potentially troublesome areas — mean less wear. Simple, solid construction and high interrupting capacity are positive assurance of reliability.

For continuous air-conditioning service during peak summer loads, be sure to get the proven dependability of Allis-Chalmers contactors. It is these contactors that make all 600 volt Allis-Chalmers Size 4-8 reduced voltage starters the reliable performers they are.

Call your nearby A-C sales office or distributor for complete information, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

*7th meaning, Webster's New Collegiate Dictionary, Second Edition.

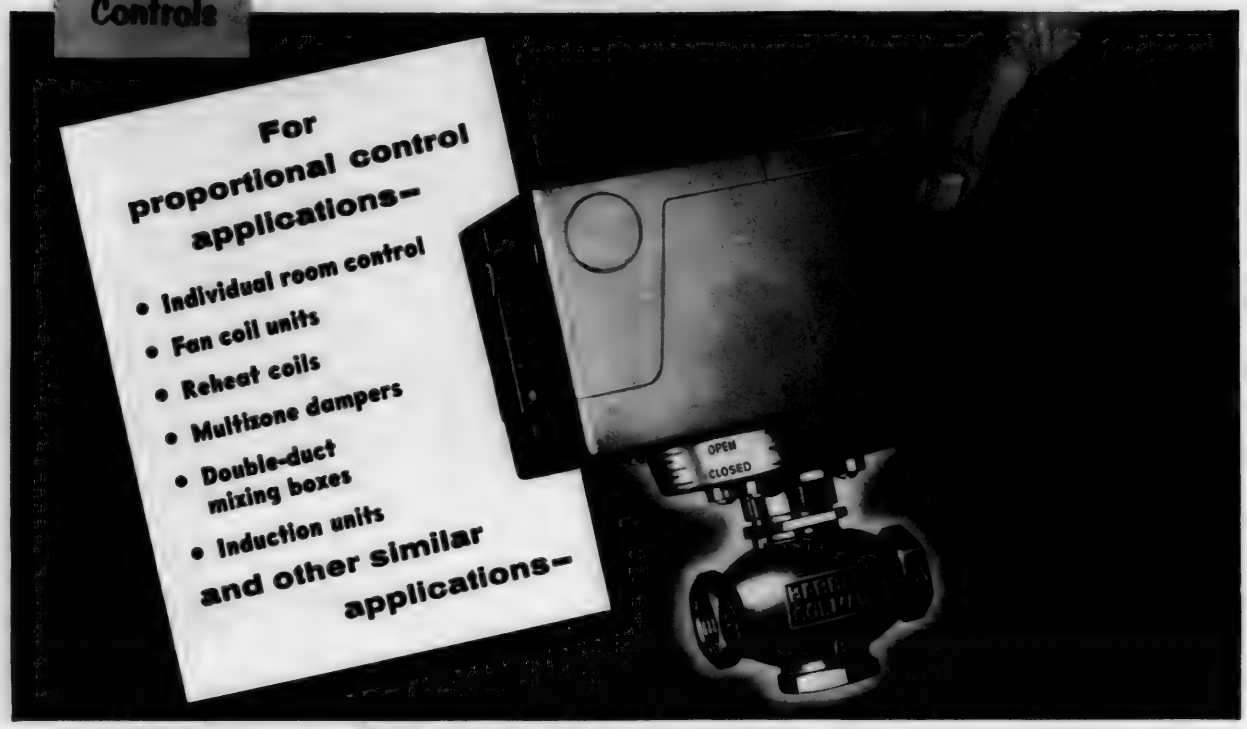
ALLIS-CHALMERS

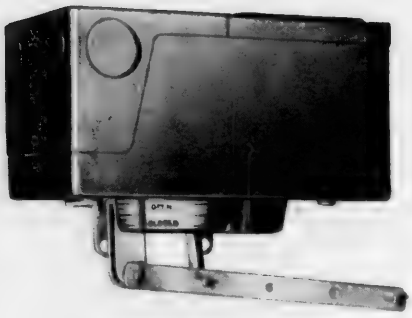
A-5783

BARBER COLMAN
Automatic Controls

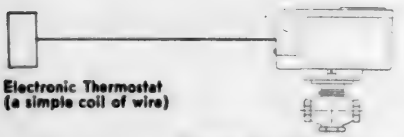
NEW!

A Transistorized Electronic Motor Operator





—with lever for air damper control



Schematic Transistorized Motor Operator (no tubes or relays)

Transistors eliminate tubes and relays giving you the benefits of electronic control at no extra cost

Now for the first time, electronic system control is available at a cost comparable with "standard commercial equipment."

The transistor operator is an electronically controlled device containing a transistorized amplifier and an operating mechanism designed for proportional operation of a valve or damper.

Virtually self-contained, the simple attachment of a two-wire sensing element to the operator forms a system of electronic control (see schematic).

Check these "plus features":

- Simplified, compact unit through the use of transistors.
- Long, trouble-free performance and low maintenance through the elimination of tubes and relays. All moving parts operate submerged in oil.
- Simplifies installation because of compactness and self-contained design.
- Spring return action provides fail-safe performance. Operator returns to "off" position in case of power failure.
- Operator can be easily converted from direct to reverse acting.

Call your Barber-Colman representative or write today for brochure F8991.

BARBER-COLMAN COMPANY

Dept N, 1302 Rock Street, Rockford, Illinois • Field Offices in Principal Cities

NEW CATALOGS

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

PNEUMATIC SPREADER STOKERS — Iron Fireman Manufacturing Co., Cleveland, Ohio, has reissued a 12-page booklet with detailed information on Series 401 pneumatic spreader coal stokers, which automatically meter, dry, preheat, convey and efficiently fire all sizes of coal from dust to 2-inch top size and all grades from lignite to the best bituminous. System continually adjusts firing rate to steam demand, maintains correct air-fuel ratio.

Circle **Item 63** on Inquiry Card

UNIT TANDEM BLOW-OFF VALVES— Bulletin B-435, Supplement A, published by Yarnall-Waring Co., Philadelphia, Pa., describes new unit tandem blow-off valves for boiler blow-off pressures to 665 psi, basic pressure rating 400 psi. In addition to a full description, bulletin also contains operating details, materials, dimensions, and advantages.

Circle **Item 64** on Inquiry Card

BENT TUBE BOILERS — A 22-page brochure is published by Henry Vogt Co., Louisville, Ky., describing the company's Class VF and VS two-drum bent tube boilers. Bulletin VF-VS-2 provides sectional engineering drawings and principal data for units in 18 different installations throughout the country. Two pages of shop operation photos are also included.

Circle **Item 65** on Inquiry Card

NEW INSULATION MATERIAL — A 4-page folder, FS-1, describing its new insulating and refractory material, Foamsil, is available from Pittsburgh Corning Corp., Pittsburgh, Pa. A list outlining the physical characteristics of the material, along with recommendations for its possible uses, is contained in the folder. Available shapes are illustrated.

Circle **Item 66** on Inquiry Card

HIGH EFFICIENCY FILTERS—American Air Filter Co., Louisville, Ky., announces a bulletin describing three types of high efficiency mechanical filters: Type F, Airmat Deep Bed and Multi-Pak. Bulletin No. 238 contains illustrations of media and full assemblies. In addition, filter selection tables, charts of engineering data, and performance curves are included in the brochure.

Circle **Item 67** on Inquiry Card

CLAY PIPE MANUFACTURING—A commemorative souvenir booklet, marking completion of its new million-dollar plant and major expansion of its manufacturing facilities, is published by Logan Clay Products Co., Logan, Ohio. The illustrated 16-page booklet describes the company's automatic clay-handling equipment, horizontal pipe-making machines, automatic take-off and finishing equipment, tunnel drier and preheater, and 363-ft, gas-fired tunnel kiln.

Circle **Item 68** on Inquiry Card

HEAVY DUTY SPACE HEATERS—An 8-page bulletin gives complete engineering data on the redesigned line of heavy duty space heaters now in production by Reznor Manufacturing Co., Mercer, Pa. Bulletin gives complete construction details and specification data on ten models for gas, oil or gas-oil firing ranging in capacity from 400,000 to 2,000,000 Btu per hr output. Data include dimensions for upflow, down-flow and horizontal installation, lists of control elements with a step-by-step description of the operating sequence, air throw figures for various louver arrangements, and details on the burner assembly.

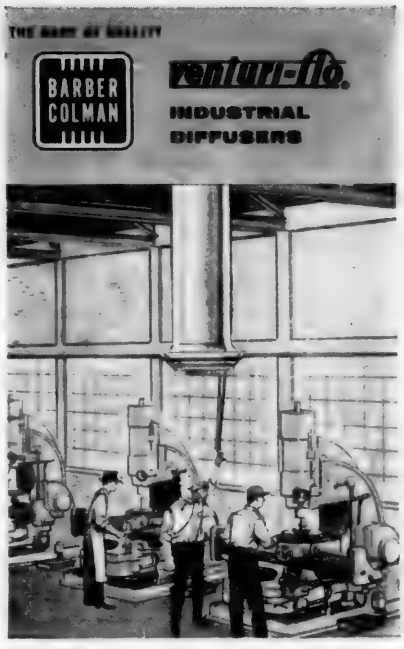
Circle **Item 69** on Inquiry Card

STRAIGHT SIDE CRANK PRESSES — Just published by Niagara Machine & Tool Works, Buffalo, N. Y., Bulletin No. 64 introduces the company's redesigned and expanded line of straight side single and double crank presses. Presenting both standard and enclosed models, this 44-page catalog contains complete, illustrated information on all operating and structural features. Included are charts and tabulated information concerning punch and press speeds, and detailed specifications.

Circle **Item 70** on Inquiry Card

FAN-NOISE CALCULATOR—In the execution of noise control programs it is necessary to (a) measure sound, (b) know maximum allowable noise limits, (c) design noise absorbing or reducing methods, and (d) predict noise increase when new equipment is installed. Although the first three steps have been simplified by modern research, the fourth has remained a complicated procedure because of inaccurate measuring systems and a series of obscure formulas. However, this company's acoustical engineers have recently developed the "sone" rating system, which not only rates the sound pressure level but also takes into account the effect of frequency on the human ear. This single numerical rating can now be manipulated as easily as kilowatts in the design of industrial and commercial buildings. A slide rule calculator, utilizing sone ratings, simplifies noise calculations. Calculators are available at no charge when requested of Propellair Div., Robbins & Myers, Inc., Springfield, Ohio, on your company letterhead.

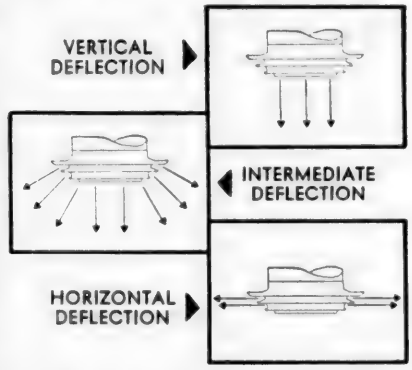
(Continued on page 140)



Fresh air at working level improves employee efficency

Barber-Colman Model BP Venturi-Flo industrial diffusers permit air to be piped down to working level. This prevents stagnant, smoky air which has collected near the roof, from being mixed with the incoming fresh air. The contaminated air is readily expelled by roof exhaust fans. Employee comfort and efficiency are measurably improved.

The Venturi-Flo industrial diffuser can be adjusted easily from the floor to deliver any air pattern. In warm weather, the air should be delivered close to, or even directly at, the worker; while



during cool evenings, or in cold weather, the air should be diffused above the head of the worker, providing adequate ventilation, but eliminating cold drafts.

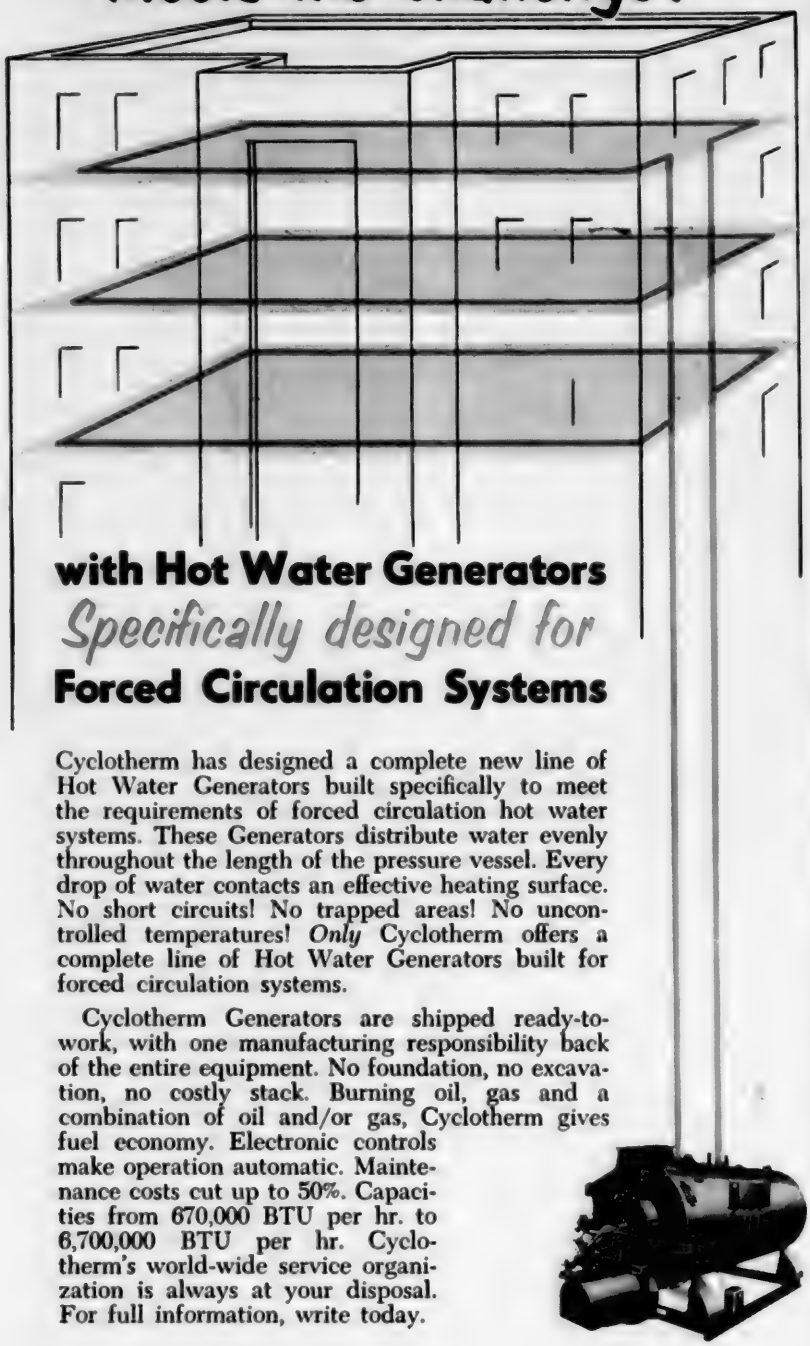
A complete range of sizes is available to meet any industrial requirement. Get complete information in Bulletin F7722-1 — performance data, installation diagrams, and dimensions. Call your Barber-Colman field office or write:

BARBER-COLMAN COMPANY

Dept. N, 1102 Rock Street, Rockford, Illinois

CYCLOTHERM

meets the challenge!



with Hot Water Generators

Specifically designed for

Forced Circulation Systems

Cyclotherm has designed a complete new line of Hot Water Generators built specifically to meet the requirements of forced circulation hot water systems. These Generators distribute water evenly throughout the length of the pressure vessel. Every drop of water contacts an effective heating surface. No short circuits! No trapped areas! No uncontrolled temperatures! *Only* Cyclotherm offers a complete line of Hot Water Generators built for forced circulation systems.

Cyclotherm Generators are shipped ready-to-work, with one manufacturing responsibility back of the entire equipment. No foundation, no excavation, no costly stack. Burning oil, gas and a combination of oil and/or gas, Cyclotherm gives fuel economy. Electronic controls make operation automatic. Maintenance costs cut up to 50%. Capacities from 670,000 BTU per hr. to 6,700,000 BTU per hr. Cyclotherm's world-wide service organization is always at your disposal. For full information, write today.

YEARS AHEAD IN STEAM & HOT WATER GENERATION

CYCLOTHERM®

Steam & Hot Water Generators

Cyclotherm Division National-U.S. Radiator Corp.

56 E. First St., Oswego, N. Y.

Clip to your letterhead

56

Please send me your new folder: "For The First Time . . . Package Boiler Economy for Modern Hot Water Systems."

NEW CATALOGS

(Continued from page 139)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

HOT-WATER HEATING COILS—A bulletin on its line of hot-water heating coils is published by Halstead & Mitchell, Pittsburgh, Pa. Produced in a wide range of sizes for central station or zone air conditioning systems, secondary and primary surfaces of these hot-water coils are balanced for maximum efficiency and low air friction. Bulletin HWC-200 provides complete dimensional data on the hot-water coils, and contains rating data for selection of the proper coils for most applications.

Circle **Item 71** on Inquiry Card

CENTRIFUGAL ROOF VENTILATORS — An 8-page brochure (Bulletin 4004) describing construction features, capacities, quietness levels and accessories of the company's new line of centrifugal-type roof ventilators is available from American-Standard, American Blower Division, Detroit, Mich. Design and construction features of 13 basic ventilator sizes including 111 different motor and belt-drive combinations are listed for various building environments. A table of relative quietness levels lists quietness ratings for different types of space.

Circle **Item 72** on Inquiry Card

STAINLESS STEEL VALVES— A catalog, describing the complete line of No. 5955 stainless steel gate, globe and swing check valves manufactured by Jenkins Bros., New York, N. Y., gives full details about valve patterns in alloys that satisfy the requirements of most corrosive services. Adding to the usefulness of the catalog is a 10-page section which shows at a glance the degree of resistance of the alloys to many corrosive media under varying conditions.

Circle **Item 73** on Inquiry Card

TRENCHING - LOADING MACHINE — The 42-hp Utility Model 310B wheel-mounted backhoe-loader is described and illustrated in 8-page Bulletin CUS-110, published by J. I. Case Co., Racine, Wis. The booklet presents 35 operating advantages of the "matched" trenching-loading machine, plus pertinent mechanical details of the backhoe, loader, and heavy-duty tractor.

Circle **Item 74** on Inquiry Card

(Continued on page 142)

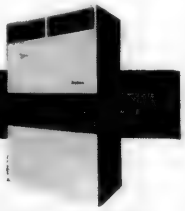
My client is 17° cooler and 93% happier now ...with Chrysler Air Conditioning

"Why did I put Chrysler Packaged Air Conditioning in the specifications? For the many engineering exclusives it offers. For example, the new Power Miser compressor cuts operating and maintenance costs. And, the Maxi-Fin coil removes moisture faster. My client saves money. And his employees and customers are happier."

"Working is a pleasure here . . . with Chrysler Airtemp Air Conditioning. Whether it's 120° above, or 5° below—we've got Spring. That's *real* all-weather operation for you . . . and it's another Chrysler exclusive."

"Masterful engineering is just one of the reasons my building's got Airtemp. Chrysler's 25 years of leadership in packaged air conditioners assures dependability. With almost 300 models to choose from, I got exactly the right unit for my requirements. And it includes—as standard—safety features most manufacturers don't offer—even as extras.

Before you figure your next job, why not get all the facts and figures on Chrysler Packaged Air Conditioning. Contact your local Airtemp Distributor. Or write direct.



CHRYSLER
AIRTEMP

Airtemp Division, Chrysler Corporation, Dept. I-29, Dayton 1, Ohio

for DUST

CONTROL

install

FLEXAUST HOSE

Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of dust collecting uses, particularly good for elbows and moving hoods.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Sizes 1¼" thru 36" i.d.

Write for details today
Distributors in all principal cities

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Dept. HV-2
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NEW CATALOGS

(Continued from page 140)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

STAINLESS TUBULAR PRODUCTS — Those responsible for the procurement of stainless tubing, welding fittings and flanges are offered a new technical data folder, TDC-190, published by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. Folder contains data on analyses, corrosion and oxidation resistance, high and low temperature characteristics, physical and mechanical properties of the family of 18-8 stainless steels.

Circle **Item 75** on Inquiry Card

DEAERATING HEATERS—A revised and enlarged bulletin, WC-106A, on tray type deaerating heaters is available from Graver Water Conditioning Co., New York, N. Y. Bulletin covers a variety of subjects including principles of deaeration; tray heater operation; standard heater design and applications; accessory equipment, and design and fabrication of the company's tray utility heaters. A section on design features discusses load variations, installation, metallurgy and construction of trays, as well as vent condensers.

Circle **Item 76** on Inquiry Card

INDUCTION CIRCULATORS — A 28-page bulletin containing complete information about induction circulators for high-pressure induction air conditioning systems is offered by Worthington Corp., Harrison, N. J. Available in three models, the company's Flexular induction circulators are adaptable to any architectural feature. Bulletin No. 1100-B101 explains how the high-pressure induction system operates, and contains selection data, unit sizes, performance ratings, and gravity heating capacities. Selection examples are included in the brochure, as well as a specification guide for engineers.

Circle **Item 77** on Inquiry Card

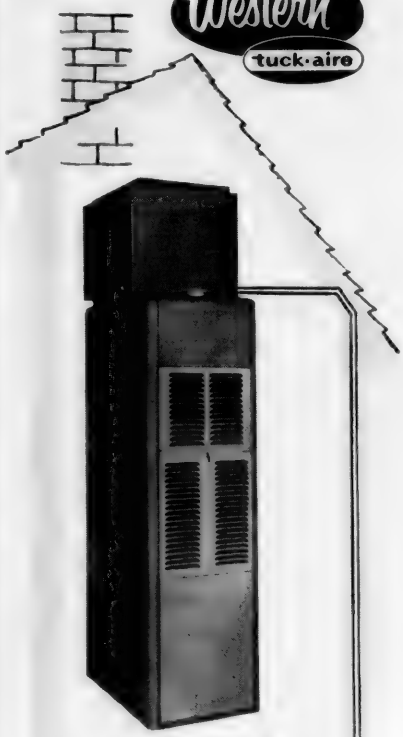
DIFFUSERS, REGISTERS, GRILLES — Data that will prove helpful to engineers in locating, selecting and sizing diffusers, registers and grilles are contained in a catalog published by Lima Register Co., Lima, Ohio. Supplementing the company's regular product sections covering heating and air-conditioning equipment is a multi-page engineering section which provides valuable installation information.

Circle **Item 78** on Inquiry Card

(Continued on page 144)

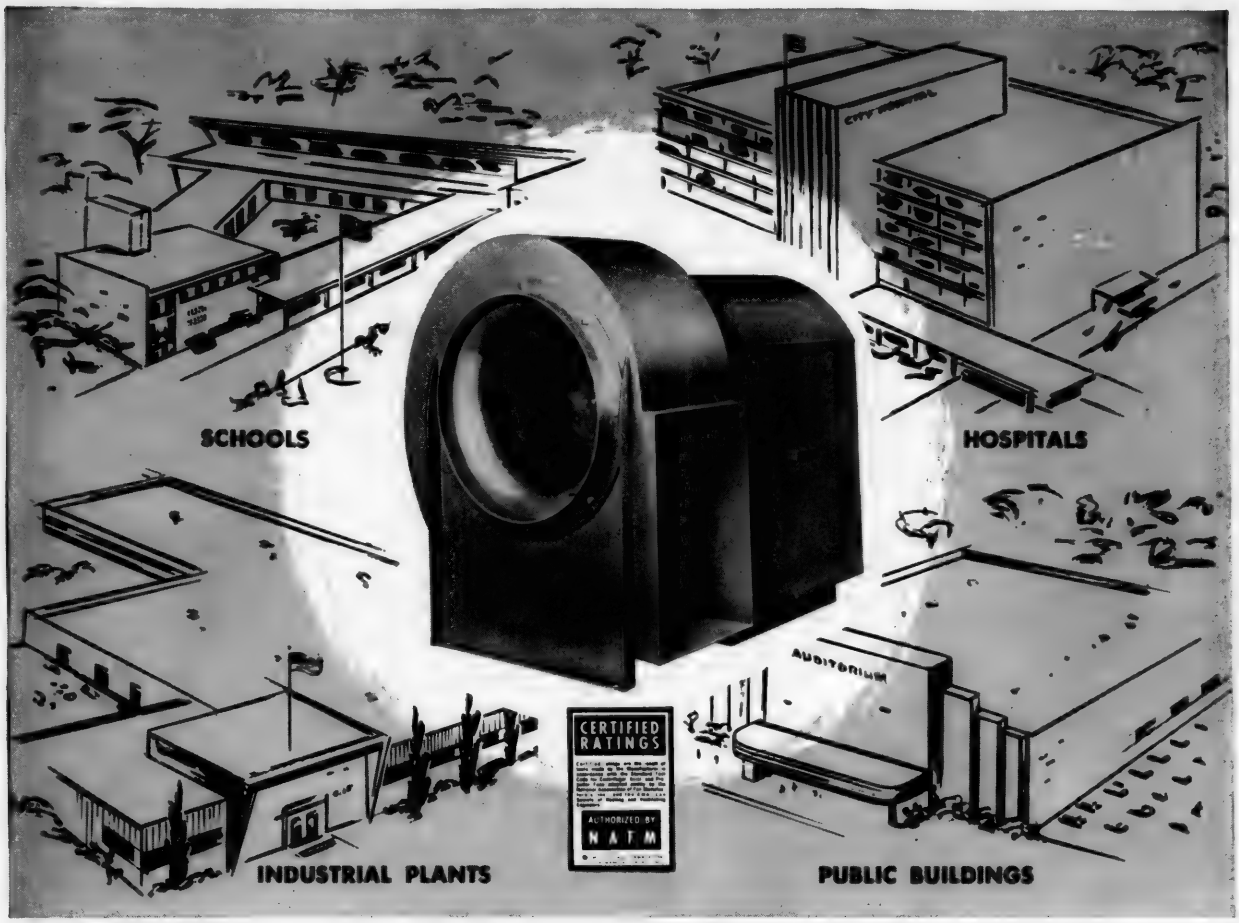
The *New* Look In Year Around Air Conditioning

Western tuck·aire



1. Filtered Forced Air Gas Furnaces
2. Counter-Flo or Up-Flo-Twenty-four Models
3. Heating Capacities—60,000 to 250,000 BTU
4. Cooling Capacities—Two to 7½ Tons
5. Air Cooled Remote Condensing Units
6. Matching Evaporator Coils

tuck·aire FURNACE COMPANY
2045 Evans Avenue • San Francisco, Calif.
"PIONEERS AND LEADERS IN AIR CONDITIONING COMFORT"



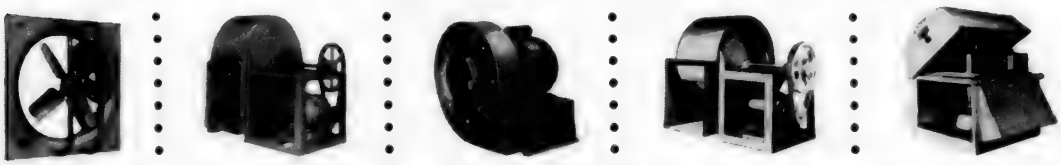
A Peerless Blower for Every Application

Quiet, dependable, trouble-free Peerless blowers require a minimum of installation space and reduce mounting costs. They offer countless discharge arrangements. The entire unit is built by Peerless, including the motor.

Peerless blowers meet and excel industry standards. They have been thoroughly tested according to test codes. Thousands of them are providing economical, continuous ventilation in installations all over the country.

Write today for Bulletins SDA-160, SDA-200 and SDA-220!

A COMPLETE LINE OF AIR MOVING EQUIPMENT



Charter Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless Electric

FAN AND BLOWER DIVISION

THE Peerless Electric® COMPANY

1400 W. MARKET ST. • WARREN, OHIO

FANS • BLOWERS • ELECTRIC MOTORS • ELECTRONIC EQUIPMENT

Look for our Catalog in Sweet's

NEW CATALOGS

(Continued from page 142)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

EVAPORATIVE CONDENSERS — Design and performance data on Perma-Fan blow-through type evaporative condensers are contained in Bulletin P-F, 511.1, published by the manufacturer, Drayer-Hanson Div., National-U. S. Radiator Corp., Los Angeles, Calif. Included are dimensional drawings, keyed to 27-point table of dimensions.

Circle **Item 79** on Inquiry Card

STEEL PLATE FABRICATIONS—An 8-page brochure, announced by Missouri Boiler and Tank Co., St. Louis, Mo., indicates, by example, the company's scope and experience in the custom fabrication of steel and alloy plate in the 3/16 to 1 1/4-inch range. Included are pressure vessels, tanks, fractionating columns, large-OD piping, field-erected breechings and stacks—shop fabricated, X-rayed, stress relieved and field erected for the chemical, petroleum, petrochemical and power industries.

Circle **Item 80** on Inquiry Card

AUTOMATIC HEATING CONTROL — A 4-page brochure describes how time switches can be incorporated into any type of heating system to make it completely autotmatic. The brochure was prepared by International Register Co., Chicago, Ill., and includes specific recommendations for the type of timer to be used in any system. Drawings showing how to wire a time switch into the thermostat-controlled circuit are presented in detail in the folder.

Circle **Item 81** on Inquiry Card

NEW RIGID PLASTIC PIPE—A 6-page bulletin describing its new rigid plastic pipe, for operation at higher temperatures and pressures than any other thermoplastic pipe, is available from Carlon Products Corp., Aurora, Ohio. Bulletin HT-100 describes Carlon HTHT plastic pipe, made from an improved type of Kralastic resin. This pipe may be used at pressures averaging 100 psi higher than other rigid plastic pipe of the same IPS size, and at temperatures up to 180 deg. F. Bulletin gives specifications and advantages of the pipe; describes typical applications; gives installation information; and includes tables and charts of working pressures, support spacing recommendations, physical properties, and resistance to common corrosive fluids.

Circle **Item 82** on Inquiry Card

NEW-TYPE WROUGHT IRON—A 64-page booklet, entitled 4-D Wrought Iron for Building Drainage Systems, provides engineers with a comprehensive discussion on piping for soil, waste, vent and downspout applications. The booklet was prepared by A. M. Byers Company, Pittsburgh, Pa. Contents are divided into nine sections. First among these are reports of building piping surveys conducted by independent engineers in New York and Chicago. Results of these surveys are accompanied by photographic examples of vent corrosion. Included among the other sections are descriptions of the corrosive conditions encountered in drainage services, comparative service records, Durham versus Bell-and-Spigot systems, and typical installation and performance tables.

Circle **Item 83** on Inquiry Card

NOISE CONTROL—H. H. Scott, Inc., Maynard, Mass., manufacturer of instruments for the measuring and analysis of sound, announces a new edition of its booklet, Noise Simplified. This booklet contains useful information on instrumentation, measurement, analysis, and control of sound.

Circle **Item 84** on Inquiry Card

PRESSURE REDUCING VALVE—A catalog sheet, available from Atlas Valve Co., Newark, N. J., describes the company's Fig. 1910, Type E reducing valve for initial pressures to 300 psi with gas, oil or water. Outlet or regulated spring ranges are 5-35, 20-60 and 40-90 psi. Valve is also made with a reverse seating arrangement to operate as a relief valve.

Circle **Item 85** on Inquiry Card

ALUMINUM PLUMBING FIXTURES — Aluminum Plumbing Fixture Corp., Burlingame, Calif., announces that new specification sheets, with installation instructions, as well as a complete catalog are available for all its unbreakable fixtures. All standard models are described, as well as the unique combination wash basin and water closet.

Circle **Item 86** on Inquiry Card

THERMOWELL MATERIAL GUIDE — Thermo Electric Co., Inc., Saddle Brook, N. J., offers a 4-page thermowell material guide for over 325 different temperature measuring applications. This guide was designed to aid thermowell users in selecting the proper thermowell material for a given application and operating condition. Applications are grouped in chart form according to the type of industry.

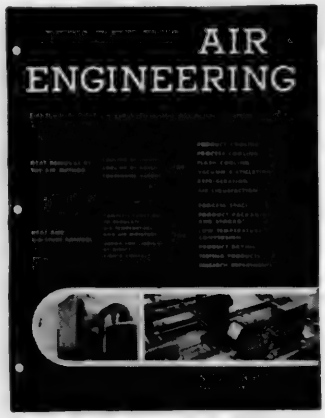
Circle **Item 87** on Inquiry Card

(Continued on page 146)

AIR ENGINEERING by NIAGARA

- AIR CONDITIONING with precise regulation of air temperature and air moisture for processing, for product drying, packing, storing, low temperature conversion, for testing and research.
- "NO FROST" REFRIGERATION for food and low temperature conversion, for testing and operations at extreme low temperatures; for moisture control below the freezing point of water.
- AFTER COOLING and air drying for large air and gas compressors and AIR LIQUEFACTION.
- COOLING ENGINES, COMPRESSORS, HYDRAULIC PRESSES.
- COOLING QUENCH BATHS, FURNACES, INERT ATMOSPHERES.
- COOLING ROLLS, WELDERS, DRAWING OR EXTRUSION DIES.
- PRODUCT AND PROCESS COOLING CHEMICALS OR INTERMEDIATES.
- COOLING LIQUIDS OR GASES IN CLOSED SYSTEMS.
- VAPOR CONDENSING UNDER VACUUM.
- REFRIGERANT CONDENSING.
- ELECTRONIC PROCESS COOLING.

You will reduce your costs, solve your problems of water supply or disposal and get HIGH OPERATIONAL EFFICIENCY with Niagara "Aero" Evaporative Heat Exchangers, After Coolers, Condensers, Air Conditioners or Coolers for these important plant services or processes.



Write for this Bulletin No. 135

High operational efficiency means: precise temperature for improved product and process quality control, heat removal at rate of input, simple operating conditions, real economy in upkeep, sustained full capacity. It means the lowest expense for up-keep.

Write for Bulletin 135

NIAGARA BLOWER COMPANY

Dept. HV-2 , 405 Lexington Ave., New York 17, N.Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

Famous

SALK HALL

at the University of Pittsburgh to be serviced by Ric-wiL underground piping . . .

Salk Hall is where Dr. Jonas E. Salk and his staff are conducting their continuous virus studies. This ten-story building will eventually become a center for experimental medicine with additional space for research conducted by many faculty members.

Ric-wiL is proud to be a part of this great institution and has, since 1932, supplied the underground steam distribution lines. Over 10,000 feet of Ric-wiL serves an area more than a half-mile long and a half-mile wide.

Over 500 universities, colleges and schools are presently using Ric-wiL Piping Systems.

We invite your inquiry regarding the many types of Ric-wiL Systems available.

Salk Hall and campus photo courtesy of University of Pittsburgh.

Write, wire or phone for complete literature.

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

SINCE 1910

RIC-WIL INCORPORATED — PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

See our catalog in Sweet's

NEW CATALOGS

(Continued from page 144)

FUEL BURNING SYSTEM—An 8-page bulletin, No. 1255, describing the Model 3 fuel burning system manufactured by Orr & Sembower, Inc., Reading, Pa., lists 11 sizes of oil, gas and combination gas and oil burners for firing boilers or other heat exchange equipment. These air/steam atomizing oil and partial pre-mixing gas burners are the same as furnished on the Powermaster packaged automatic boiler.

Circle **Item 88** on Inquiry Card

INDICATING DIAL THERMOMETERS — Twelve-page Catalog 205 describes a completely redesigned line of indicating dial thermometers offered by U. S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa., for temperature measurements in the range from minus 40 to plus 1000 deg F. Catalog gives specifications for both direct and remote reading types which are included in the company's new filled-system thermometer line. It also contains information on the four types of filling mediums, as well as thermometer case sizes, materials, and styles. Tables give useful selection data and dimensions for cases, bulbs, and bulb connections.

Circle **Item 89** on Inquiry Card

MONEL, NICKEL VALVES—Bulletin No. 9, published by Alloy Steel Products Co., Inc., Linden, N. J., broadly defines the applications of cast monel and nickel valves to corrosive environment. Their respective areas of usefulness are described, chemical and mechanical properties are given, and several basic Aloyco valve designs are illustrated.

Circle **Item 90** on Inquiry Card

PACKAGED WATER CHILLERS—An 8-page bulletin describes Model RG packaged water chillers manufactured by Acme Industries, Inc., Jackson, Mich. The unit is a completely new design which has been markedly reduced in size and weight compared to previous models. Capacity range is from 3 through 30 tons. Catalog No. 515 includes description, performance data, specifications and dimensions.

Circle **Item 91** on Inquiry Card

COOLING SYSTEM LAY-UP — Suggestions for the winter lay-up of air conditioning systems are the subject of a technical bulletin published by Water Service Laboratories, Inc., New York, N. Y. The leaflet describes several procedures which, if followed before the equipment is shut down for the winter, will insure trouble-free start-up in the spring. Subjects covered are float valves and ballcocks, flushing and cleaning, strainers and screens, refrigerant condensers, fans and louvers, painting, and closed circulating systems.

Circle **Item 92** on Inquiry Card

PNEUMATIC TEMPERATURE CONTROLS—A 4-page folder describing its line of pneumatic temperature controls is issued by Partlow Corp., New Hartford, N. Y. The folder introduces Model RVA, recording pneumatic temperature control, and Model IVA, indicating pneumatic temperature control. Especially suitable for operation where steam is used as the heating medium, the pneumatic systems are completely self-contained and use no electricity. Being explosion-proof, the controls may be used in any hazardous location.

Circle **Item 93** on Inquiry Card

VIBRATION-ISOLATION MATERIAL — A brochure on a shock dampening and vibration-isolation pre-formed pad material, for heavy machinery manufacturers and plant maintenance engineers, is announced by Preformed Pad Div., Voss Belting & Specialty Co., Chicago, Ill. The manufacturer reports that Sorbtex withstands loads up to 20,000 psi, retains its original dimensions under frequent compression and impact for long periods of time, and has a small limited creep, predictable within narrow limits. This new material is said to resist oil, steam, mildew, cold, brine and abrasive action.

Circle **Item 94** on Inquiry Card

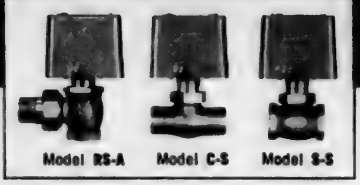
for satisfied customers and more sales volume .

sell

ZONVALVE

the best in modern

ZONED HEAT



Model RS-A Model C-S Model S-S

ZONED HEAT means:
more comfort, less fuel!

Zoned heat is now recognized as the ultimate in modern heating. Its advantages are two-fold:

1) *Comfort* – each area of the home or building may be heated automatically to the desired temperature.

2) *Economy* – heating plant need no longer burn fuel to furnish unwanted heat.

ZONE CONTROL VALVES are the most *economical* devices for accomplishing zone heating control. With them, multiple zones may be individually controlled from a single burner and circulator.

Each zone is controlled by its own thermostat. All wiring is inexpensive low-voltage.

ZONVALVES mean:
more profits, better jobs!

ZONVALVE is a zone-control valve of *outstanding quality*, as well as extremely low price.

Zonvalve is thermostatically operated. All Zonvalves contain a built-in auxiliary switch, which *automatically* starts circulator or burner, when any Valve is in "open" position.

Zonvalve may be installed in any position on supply piping or individual radiator. In modernization, Zonvalve replaces the ordinary radiator valve with *no piping change*, no shutdown of heating system.

Zonvalve is compact, rugged in construction. It is manufactured in standard tubing and pipe sizes. Operates on steam and hot water systems. *Unconditionally guaranteed.*

Zonvalve is ideal for zoned heat in homes, offices, factories, hospitals, hotels and motels.

For fast sales, *sell Zonvalve!*

For full details, ask your wholesaler or write for Brochure D-2.

HEAT-TIMER CORP. · 657 BROADWAY NEW YORK 12, N. Y.

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

METERED LP-GAS SERVICE—A 4-page folder describing the advantages that metered LP-gas service provides is offered by American Meter Co., Erie, Pa. The illustrated folder details the ways in which metered service provides economy, comfort and convenience to the LP-gas customer.

Circle **Item 95** on Inquiry Card

MAGNETIC STARTERS— Cutler-Hammer Inc., Milwaukee, Wis., announces a 15-page booklet describing its Three Star line of a-c magnetic starters in NEMA sizes 0 through 4 for both reversing and non-reversing single phase and squirrel cage motors. Detailed description of the line's component units and elements covers such items as magnet coils, overload relays, contact assembly, and enclosure types. Description of the individual starters includes general information on each as well as ratings and dimensions.

Circle **Item 96** on Inquiry Card

PRE-ENGINEERED LAB FURNITURE — Steelab pre-engineered sectionals make it possible to set up a completely equipped laboratory virtually within 24 hr. A 24-page catalog shows how this is done, with a comprehensive line of interchangeable "package" units. Catalog illustrates and describes drawers, cupboards, sinks, tables, desks, chairs, storage cabinets, fume hoods, auxiliary units, and a full line of accessories and service fixtures. The manufacturer, Laboratory Furniture Co., Inc., Mineola, L. I., N. Y., also provides a Planning Kit of cut-out templates and scaled planning paper to develop floor plan to fit every lab requirement.

Circle **Item 97** on Inquiry Card

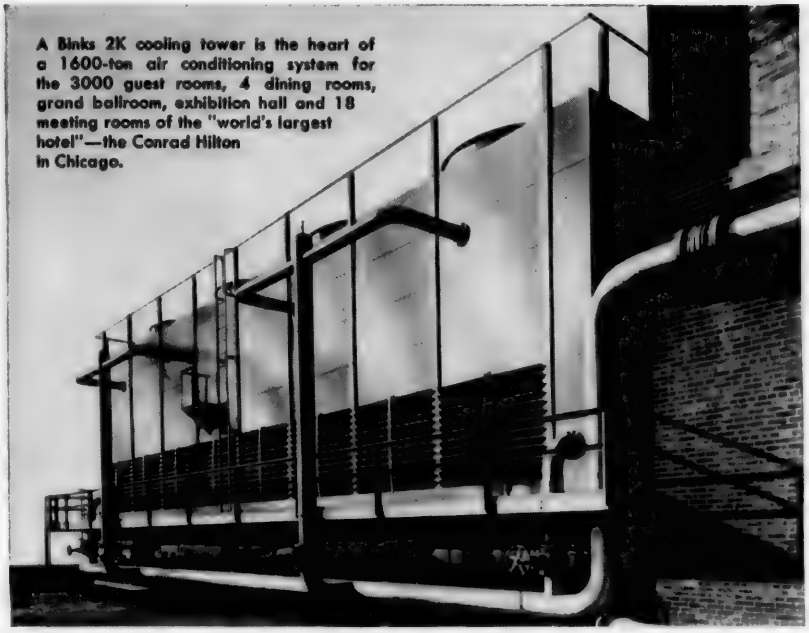
GENERAL SERVICE VALVES — Valves for general services are discussed in 20-page Bulletin E-165, published by Everlasting Valve Co., Jersey City, N. J. Types, typical services, construction, and operating features are covered.

Circle **Item 98** on Inquiry Card

INDUSTRIAL FILTERS— Comprehensive information about new Corning industrial filters is given in a 4-page bulletin issued by Corning Glass Works, Corning, N. Y. Filters are designed primarily for filtration of corrosive fluids, but also show promise in the fields of flow control, gas diffusion and purification. Structure, flow rates, and thermal, chemical and mechanical properties are covered in the bulletin.

Circle **Item 99** on Inquiry Card

(Concluded on page 148)



A Binks 2K cooling tower is the heart of a 1600-ton air conditioning system for the 3000 guest rooms, 4 dining rooms, grand ballroom, exhibition hall and 18 meeting rooms of the "world's largest hotel"—the Conrad Hilton in Chicago.

CONRAD HILTON HOTEL, CHICAGO

Saves $75,000 a year on water with Binks 2K cooling tower

"In 1956 we installed a Binks 2K cooling tower. It is more than paying its own way," reports Mr. H. M. Toombs, chief engineer for the Conrad Hilton Hotel, Chicago.

Only 5% daily make-up

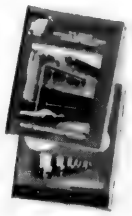
"On a one-pass basis our 1600 ton air conditioning system would use six million gallons of cooling water daily. Instead we recycle 8600 gallons and our actual consumption is about 430 gallons daily through evaporation or drift. The efficiently balanced air-to-water ratios and counter air-water flow lowers entering water from 95° F to 85° F before it is returned to the condenser."

Maintenance savings

"In addition to water savings, the corrosion-resistant features of the Binks 2K tower will provide substantial savings in maintenance, also. The structural framing is hot-dipped galvanized after forming. Casing sheets of 16 gauge steel are also heavily galvanized and the four 120-ft. fans are of aluminum alloy."

Big job or small—call Binks

Binks towers offer you complete selection flexibility for every air conditioning or industrial process cooling need. Bulletins 333 and 477A describe these towers. Ask your Binks Branch Office for a copy. There is no obligation.



A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company

3120-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

AirMpeler
LO-BOY
CENTRIFUGAL
ROOF EXHAUSTERS
Enhance The Beauty Of Building Skylines

Lowest Silhouette Design

FORWARD OR BACKWARD CURVE WHEEL WITHIN . . . . OR OUT OF SCROLL HOUSING

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE
SIZES 10"-72" 600-47,000
CERTIFIED C.F.M. RATINGS

- QUALITY
- BEAUTY
- PROVEN PERFORMANCE

See Sweet's File 20c/Amm or Write for bulletin AC-100-59

AMMERMAN CO., INC.
Stillwater, Minnesota
MEMBER OF THE AIR MOVING & CONDITIONING ASSN.

NEW CATALOGS

(Concluded from page 147)

Use the prepaid postcard on last page for securing your copies of catalogs described in this department.

GAS PRESSURE REGULATORS — A 36-page catalog covering a complete line of cylinder, manifold and station pressure regulators is available from Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York, N. Y. Form ADC 705F contains flow and pressure specifications, as well as inlet and outlet connection dimensions, for each regulator. Adapters, station valves, flowmeters, hose connections and pressure gages are also described in detail.

Circle **Item 100** on Inquiry Card

CONTINUOUS WELD PIPE— Technical information and specifications on continuous weld pipe are contained in an 8-page booklet issued by Jones & Laughlin Steel Corp., Pittsburgh, Pa. Color photographs show manufacturing process at J&L's two new continuous weld pipe mills, both of which went into production during the past year. In addition, bulletin contains a schematic drawing of the production of continuous weld pipe, which the company markets under the tradename of Jal-Con-Weld.

Circle **Item 101** on Inquiry Card

REGULATORS AND GRILLES — Young Regulator Co., Cleveland, Ohio, offers an illustrated catalog describing its complete line of regulators, grilles and baseboard diffusers.

Circle **Item 102** on Inquiry Card

FINNED-TUBE RADIATION—A manual describing Sil-vector airfoil radiation is available from the manufacturer, Radiant-Ray Radiation, Newington, Conn. This finned-tube radiation provides efficient, economical heating of contemporary buildings. Typical installations are illustrated; manual also contains engineering data, installation instructions, ratings, and other data.

Circle **Item 103** on Inquiry Card

FILM ON WELDING—In this 8-min sound and color 16 mm motion picture, the beginner is given an orientation in Heliarc welding—how its works and what it can do. The movie shows the basic pieces of equipment and their relationship to each other, how to make a simple weld, and the excellent results that can be expected after practice. This film is available at no charge from any Linde office, or by writing to Linde Company, Div. of Union Carbide Corp., 30 East 42nd St., New York 17, N. Y.

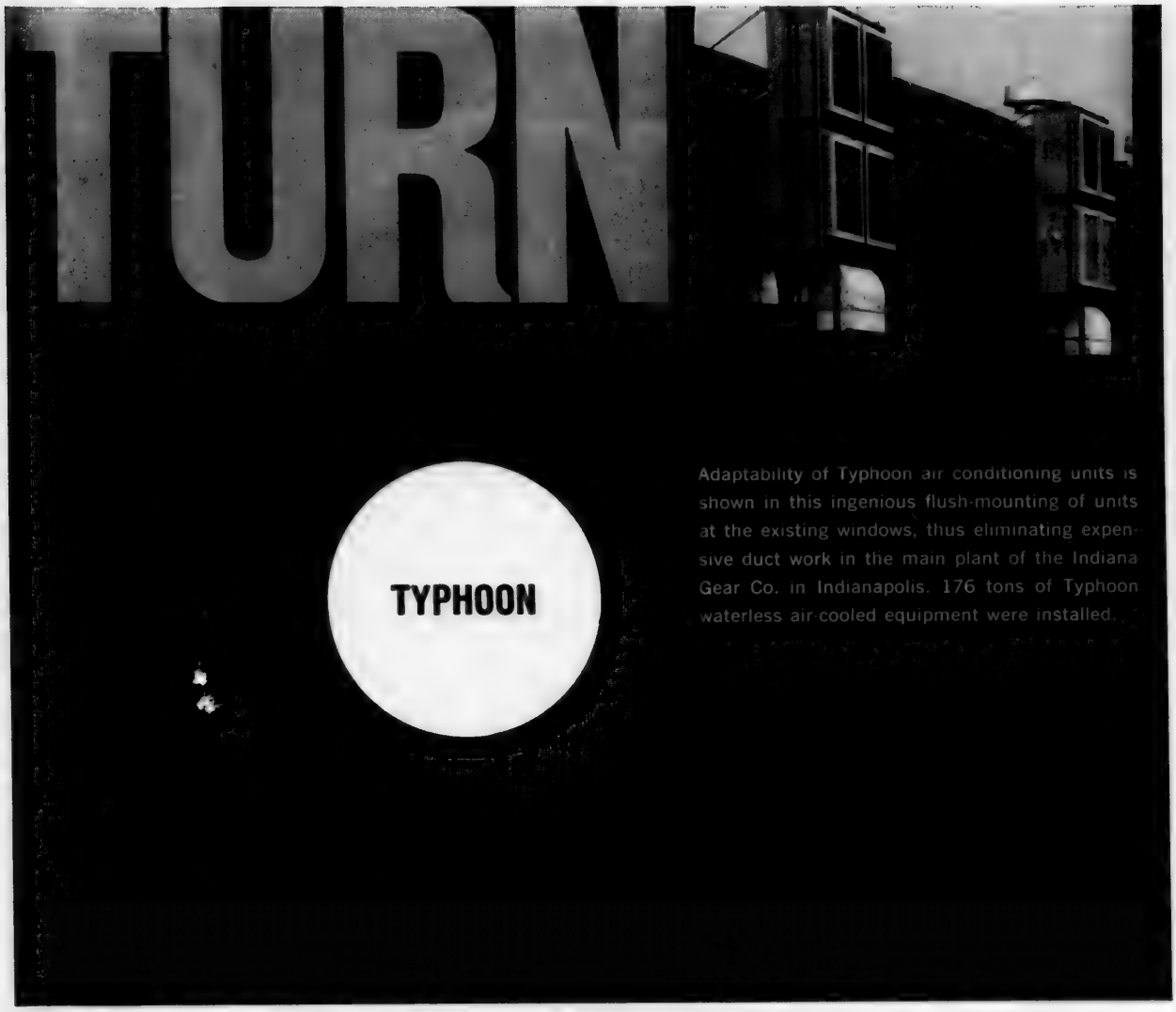
new...
THE Dwyer
Filter Gage

tells exactly when to change filters . . .
lasts indefinitely . . .
fits all furnace and air conditioning units . . .

one hole, 60 second installation

Individually packaged with display/merchandising counter sales carton. A foolproof filter gage that really works sold on a satisfaction or money-back guarantee. Write for free sample and discounts.

F. W. DWYER MFG. CO.
P. O. BOX 373-N
MICHIGAN CITY, INDIANA


TURN
TYPHOON
Adaptability of Typhoon air conditioning units is shown in this ingenious flush-mounting of units at the existing windows, thus eliminating expensive duct work in the main plant of the Indiana Gear Co. in Indianapolis. 176 tons of Typhoon waterless air-cooled equipment were installed.

AND SPECIFY THE RIGHT EQUIPMENT, FOR EVERY JOB, EVERY TIME!

Now you can fill every need, solve any problem with Typhoon's exclusive commercial, industrial and residential equipment! Save time for yourself and money for your clients with Typhoon custom-built air conditioning units. You can specify the air discharge and return arrangements you need, and the most practical location for utility service and maintenance access openings. Various combinations of compressors, cooling coils and blowers in the same cabinet provide infinite variations in performance characteristics. This extreme flexibility gives you custom made units at mass production prices. A full range of air cooled units from 2 tons to 20 tons, both packaged and split systems. Water cooled units from 3 tons to 75 tons, air cooled condensing units to 20 tons, water cooled to 75 tons! And the new Typhoon Heat Pumps that open a new era in air conditioning. Each and every unit with built-in Power Reserve—a combination of superior components and oversize parts that insures dependable performance above rated capacity through all weather extremes. All copper condensers in water cooled units, largest coil surfaces and rugged 11 and 14 gauge metal cabinets. Before you plan your next system, find out how Typhoon quality and flexibility can add to your reputation for getting the job done better, faster, more economically!

TYPHOON
DIVISION OF HUPP CORPORATION

Typhoon Air Conditioning Company, Division of Hupp Corporation
505 Carroll Street, Brooklyn 15, New York

☐ Have a representative call me for an appointment.
☐ Please send full product literature.

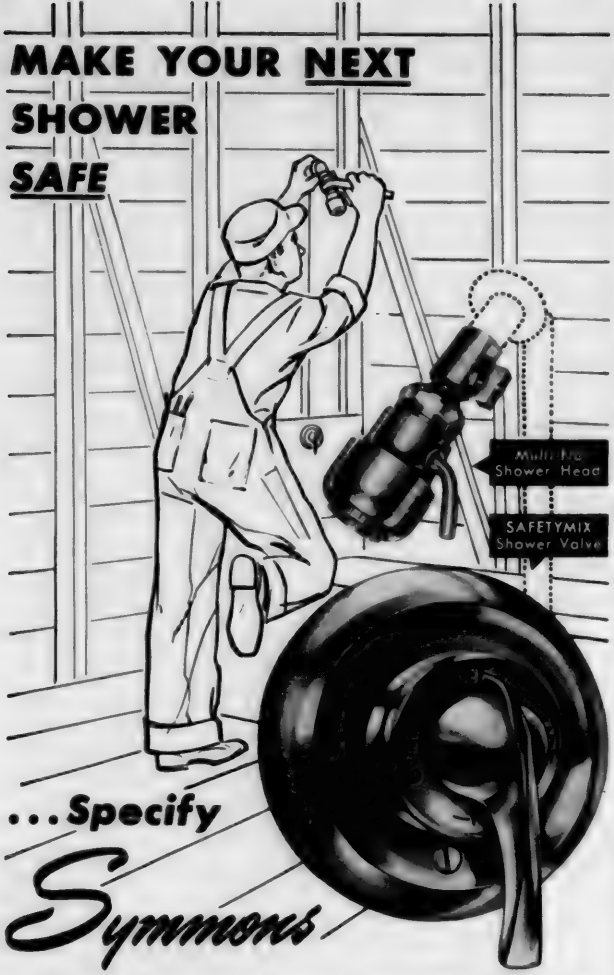
Name_____

Firm_____

Address_____

98-2

MAKE YOUR NEXT SHOWER SAFE



...Specify Symmons

SAFETYMIX

For *positive* protection in the shower insist on world famous Symmons SAFETYMIX.
It automatically eliminates the constant danger of scalds or chills.
It costs no more than ordinary shower valves.
Send for SAFETYMIX Bulletin.

Be safe . . . stay safe . . . say "SAFETYMIX."

See SWEET'S ARCHITECTURAL FILE, DOMESTIC ENGINEERING CATALOG or write us direct for further information

Symmons
ENGINEERING COMPANY
445 C STREET, BOSTON 10, MASSACHUSETTS

the equipment was operated at full capacity to overcome the setback. The next year, without set-back and an increased number of degree-days resulting from more severe weather, the total bill stayed around $1700 and the demand stayed below 145 kw.

Mr. Spillman said that if gas or oil had been used for heating, the yearly bill would have been approximately $2100. In addition, using a two-stage heat pump resulted in a 5% savings in fire insurance rates over conventional methods of heating.

WORLD REFRIGERATION CODE

for commercial field launched with American support. Designation of refrigerants, testing, safety, included.

A new extensive program of international standardization in the field of commercial refrigeration, with United States participation, was launched this year.

According to a report which has just become available through the American Standards Association, Technical Committee 86—Refrigeration—of the International Organization for Standardization (ISO), at a meeting in London, England, last September, established its objectives and organized one working group and six subcommittees to carry out the work.

The United States has accepted the administrative secretariat for Working Group 1—Designation of Refrigerant, and a Subcommittee 6—Testing of Factory-Assembled Airconditioning Units.

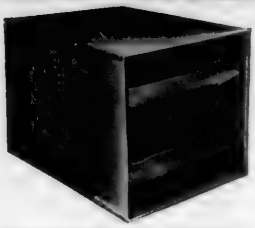
The other subcommittees formed are: 1—Safety (Secretariat, Germany); 2—Terminology, Definitions and Symbols (Italy); 3—Testing of Refrigerating Systems (Belgium); 4—Testing of Refrigerant Compressors (United Kingdom); and 5—Construction and Testing of Household Refrigerators (France).

American participation in the work of the International Organization for Standardization is arranged through the American Standards Association, as the United States member of ISO, and it accredits the delegates to ISO meetings. An advisory committee to the American Standards Association on the subject of ISO Technical Committee 86 will be formed from the United States National Committee to the International Institute of Refrigeration (IRR). IIR has an active program dealing with purely technical, non-commercial aspects of refrigeration. The work of the ISO Technical Committee 86, on the other hand, will be concerned with standards that will facilitate international commercial use of refrigerating equipment. A close liaison is planned between ISO Technical Committee 86 and IIR.

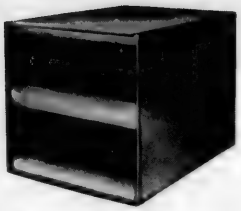
UNITED STATES STEEL'S NATIONAL TUBE DIVISION, Pittsburgh, Pa., announced the appointment of three new product managers: James P. Bacon to manager — tubing specialties products; James H. Degnan for oil country tubular products; and George O. Nations for standard pipe products. . . .

(Continued on page 152)

UNI-SILENCER* For AIR CONDITIONING and VENTILATING SYSTEMS

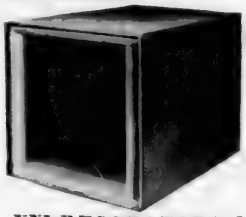


UNI-SILENCER* MODEL A. Moderate pressure drop, standard acoustical efficiency.



UNI-SILENCER* MODEL LPD. Lowest possible pressure drop, moderate acoustical efficiency

UNI-SILENCER* MODEL B. Higher pressure drop, maximum acoustical efficiency



UNI-RESONATOR* Low frequency duct silencer—used in series with UNI-SILENCERS*.

T. O. SILENCER Elbow silencer for ducts

E H ROOF VENTILATOR SILENCER for power roof ventilators

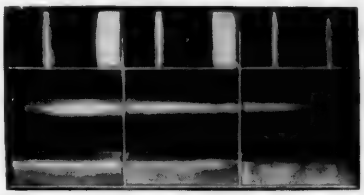
*Reg. U.S. Pat. Off.

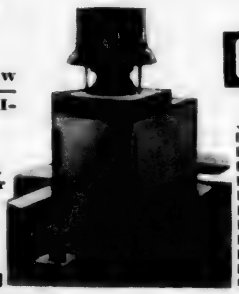
A full line of Elof Hansson silencers to effectively reduce airborne noise generated by fans in air conditioning, ventilating systems and by power roof ventilators. They are easily and conveniently installed in building structures at low cost due to new mass-production methods made possible by standardizing on modular sizes. Savings are of such proportions that UNI-SILENCER* prices compare favorably with conventional duct lining.

The performance of UNI-SILENCERS*, both as to acoustical attenuation and pressure loss have been tested and certified by independent, impartial outstanding authority. The certified data is guaranteed in writing and bonded. Free engineering service!

Fill out and mail coupon for literature today!

UNI-SILENCERS* are slip-joined in simple manner as with children's building blocks, to fit almost any conditions or requirements.





ELOF HANSSON, INC. Acoustical Division

711 THIRD AVENUE, NEW YORK 17, N. Y.

ELOF HANSSON, INC., Acoustical Division
711 THIRD AVE., N.Y. 17, N.Y., DEPT. ACH-3

Please send complete literature on performance-guaranteed Uni-Silencers and Uni-Resonators, without charge or obligation.

NAME .....

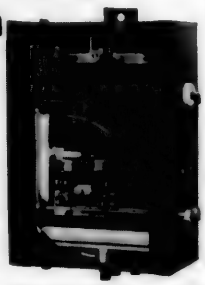
ADDRESS .....

CITY ..... ZONE ..... STATE .....

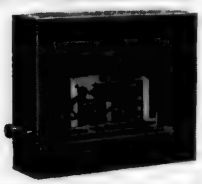
Now! Ellison Pointer Draft Gages and Air Filter Gages with Integral Alarm or Signal System!

To indicate and control pressure of Gas or Air, these indicating Draft Gages have magnetic type mercury switch for operating alarm and/or signal light. Available with one or two switches for either high or low electrical contacts for alarm purposes. Transformer, alarm bell, siren, horn signal light, 110 or 220 volts, optional.

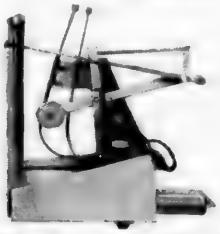
Send for Bulletin 216.



Dial Pointer Gage with Integral Alarm System. Dial scale removed.



Independent Alarm system to convert existing gages or air or gas pressure operations needing a "too high" or "too low" warning.



Straight Line Pointer Gage with Integral Alarm System. Unit shown with vertical scale, without gage housing.

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THE ELLISON LINE ALSO INCLUDES:

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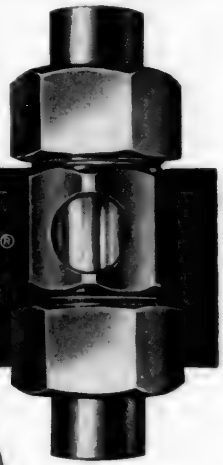

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Now Mr. Bunny's clients multiply, for only maintenance-free Roll-Kleen will he specify.

Moral:

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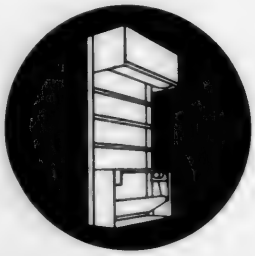

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WARREN WEBSTER & CO., Camden, N. J., has appointed Samuel Pelosi, Jr., as wholesale representative for the North Jersey territory. . . .

Samuel Greenwald, appointed president and chief executive officer of the newly formed HAMMOND VALVE CORPORATION, a subsidiary of Consolidated Diesel Electric Corporation of Stamford, Conn., was president of Hammond Brass Works, Inc., Hammond, Ind., whose business and assets were recently purchased by Hammond Valve. . . .

Robert W. Williams, appointed general marketing manager for the PLUMBING AND HEATING DIVISION, AMERICAN-STANDARD, New York, N. Y., replaces Robert W. Lear, who was promoted to corporate director of marketing. . . .

THE YOUNGSTOWN SHEET AND TUBE CO., Youngstown, Ohio, elected four new vice presidents. They are: Robert P. Bremner, in charge of raw materials; Donald S. Day, for traffic; Dr. Karl L. Fetters, for research and development; and James D. Sloan, responsible for purchasing. . . . R. E. Lenhard, executive vice-president of AIR REDUCTION SALES COMPANY, the industrial gases and welding products division of Air Reduction Company, Inc., New York, N. Y., has been appointed president of that division. He succeeds J. H. Humberstone who, as vice-president of Air Reduction Company, Inc., will devote full time to corporation affairs. . . .

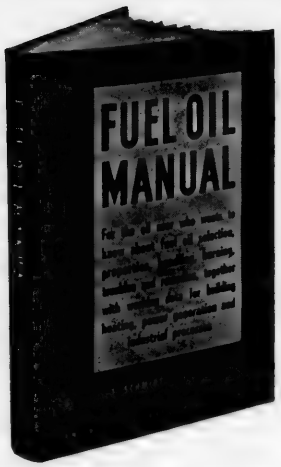
F. G. (Ted) Coggin is promoted to vice-president of DETROIT CONTROLS DIVISION of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION. Formerly general manager of sales and marketing, he will handle both line and staff responsibilities in his new post, as well as render administrative assistance to the president and execute special assignments. George F. Butterfield has been named general manager of manufacturing of the Division. He has most recently been superintendent of the Columbus plant of the corporation's American Blower Division. . . .

NIAGARA BLOWER CO., Buffalo, N. Y., has announced that Paul H. Schoepflin has been elected to the newly created position of chairman of the Board of Directors. As chairman he will remain active in the business as its chief administrative officer. Mr. Schoepflin, a graduate of Syracuse University and a life member of ASHRAE, is founder of the company and its president since 1919. Martin H. Olstad was elected to succeed him as president. He joined the company in 1929, became chief engineer in 1945, and vice-president in 1955. . . .

John C. Wallace is appointed vice-president and general manager of WALWORTH CO., New York, N. Y. He will be in charge of manufacturing, engineering, sales, and research and development. . . .

Gustav E. Olsen, vice-president and manager of New York sales for FITZGIBBONS BOILER CO., INC., New York City, died suddenly December 24 at Washington, D. C. Born in 1897, he had been associated with the

(Concluded on page 154)



Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oily property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurities and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible and all terms are fully explained.

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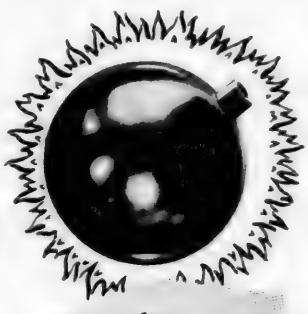

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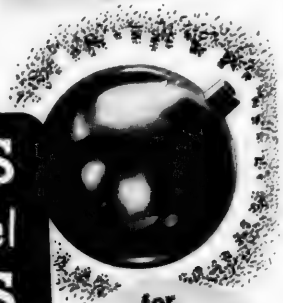

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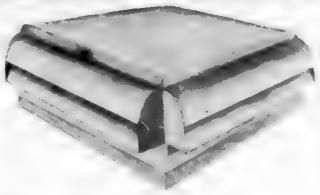

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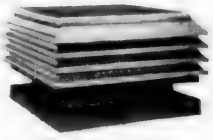

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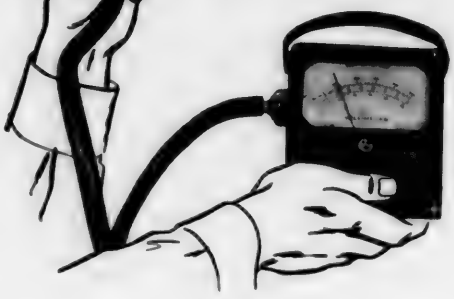

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company for 45 years. He early became affiliated with the late Homer Addams, who acquired the Fitzgibbons Boiler Company in 1921. He was honored several years ago as an outstanding alumnus by Polytechnic Institute of Brooklyn and is a past president of the New York Chapter of ASHAE.

Canadian Degree-Days for December, 1958*

City	December 1958	December Normal	Cumulative 1958	Cumulative Normal
Calgary, Alta.	1277	1430	3486	3660
Charlottetown, P. E. I.	1543	1210	3321	2850
Crescent Valley, B. C.	1144	1220	3278	3220
Edmonton, Alta.	1546	1660	3880	4070
Fort William, Ont.	1924	1680	3948	3960
Grande Prairie, Alta.	1723	1750	4311	4300
Halifax, N. S.	1312	1109	2738	2513
London, Ont.	1447	1200	2352	2680
Medicine Hat, Alta.	1340	1440	3333	3410
Moncton, N. B.	1636	1340	3528	3100
Montreal, P. Q.	1688	1390	3285	3040
North Bay, Ont.	1775	1550	3716	3620
Ottawa, Ont.	1743	1460	3422	3210
Penticton, B. C.	989	1050	2639	2590
Prince George, B. C.	1305	1440	3695	3760
Quebec City, P. Q.	1831	1530	2929	3460
Regina, Sask.	1773	1740	4264	4150
St. John, N. B.	1568	1300	3410	3130
Saskatoon, Sask.	1767	1790	4224	4250
Timmins, Ont.	1972	1740	4227	4200
Toronto, Ont.	1318	1126	2584	2522
Vancouver, B. C.	733	810	2171	2120
Victoria, B. C.	675	730	2011	1970
Windsor, Ont.	1384	1130	2610	2440
Winnipeg, Man.	1972	1778	4150	4030

* These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.
The Department reports slight revisions in the figures for November as published in last month's issue. Corrected figures are Crescent Valley, B. C., 1042; Charlottetown, P. E. I., 884; Penticton, B. C., 891.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

INDUSTRIAL VENTILATION CONFERENCE—8th annual conference on Industrial and Mining Ventilation, sponsored by the Division of Occupational Health, Michigan Department of Health; and the Department of Mechanical Engineering and Continuing Education Service of Michigan State University, to be held at Kellogg Center for Continuing Education, Michigan State University, East Lansing, Mich. Write to the University for details. **FEBRUARY 16-19, 1959.**

WARM AIR HEATING SHORT COURSE—Annual Warm Air Heating and Air Conditioning Short Course, at Purdue University, sponsored by the Indiana Sheet Metal and Warm Air Heating Contractors, and the National Warm Air Heating and Air Conditioning Association, in cooperation with Purdue University. M. E. Ocker, conference coordinator, Division of Adult Education, Memorial Center, Purdue University, West Lafayette, Ind. ..... **MARCH 16-19, 1959.**

WESTERN METAL EXPOSITION—Eleventh Western Metal Exposition and Congress, of the American Society for Metals, at the Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. R. Y. Bayless, assistant secretary of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **MARCH 16-20, 1959.**

1959 CORROSION SHOW—1959 Corrosion Show, held concurrently with the 15th annual conference of the National Association of Corrosion Engineers, at the Sherman Hotel, Chicago, Ill. T. J. Hull, executive secretary of the Association, 1061 M & M Bldg., Houston 2, Tex. ..... **MARCH 17-19, 1959.**

1959 TRADE AND CONSUMER SHOW—The 1959 New England Home Show, a combined trade and consumer show, at the Commonwealth Armory, Boston, Mass. Sherman Expositions, 250 Boylston St., Boston, Mass. ..... **MARCH 18-24, 1959.**

METEOROLOGICAL SOCIETY MEETING—175th National meeting of the American Meteorological Society, at the Shoreland Hotel, Chicago 15, Ill. K. C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. ..... **MARCH 24-27, 1959.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Americana Hotel, Bal Harbour, Fla. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 1-3, 1959.**

NUCLEAR CONGRESS—1959 Nuclear Congress, sponsored by the Instrument Society of America and coordinated by Engineers Joint Council, to be held in Cleveland, Ohio. Headquarters to be announced later. Burns & Roe, Inc., 160 West Broadway, New York 13, N. Y. ..... **APRIL 5-10, 1959.**

OHI CONVENTION—37th annual convention of the Oil Heat Institute of America, Inc., at the Olympic Hotel, Seattle, Wash. Secretary, OHI, 500 Fifth Ave., New York 36, N. Y. ..... **APRIL 28-MAY 2, 1959.**

NDHA CONVENTION—50th annual meeting of the National District Heating Association, Skytop Lodge, Skytop, Pa. Secretary-Treasurer, John F. Collins, Jr., 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 1-4, 1959.**

ASHAE MEETING—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., in Vancouver, B. C., Canada. Headquarters to be announced later. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 17, N. Y. ..... **JUNE 7-11, 1959.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 21-26, 1959.**

ASRE MEETING—Annual meeting of the American Society of Refrigerating Engineers, at the Lake Placid Club, Lake Placid, N. Y. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **JUNE 22-24, 1959.**

ISA INSTRUMENT-AUTOMATION EXHIBIT—14th annual Instrument-Automation Conference and Exhibit of the Instrument Society of America, at the International Amphitheatre, Chicago, Ill. H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 21-25, 1959.**

AGA CONVENTION—Annual convention of the American Gas Association, at the Conrad-Hilton Hotel, Chicago, Ill. C. S. Stackpole, managing director of the Association, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 5-7, 1959.**

ASRE CONVENTION—Semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Traymore, Atlantic City, N. J. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **OCTOBER 30-NOVEMBER 1, 1959**

ARI EXPOSITION—11th Exposition of the Air-Conditioning and Refrigeration Industry at Convention Hall, Atlantic City, N. J. Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 2-5, 1959.**

WARM AIR HEATING CONVENTION—Annual convention of the National Warm Air Heating and Air Conditioning Association, at the Chase Hotel, St. Louis, Mo. G. Boeddener, managing director of the Association, 640 Engineers Bldg., Cleveland 14, Ohio. ..... **DECEMBER 1-4, 1959.**

ASHAE MEETING—66th annual meeting of the American Society of Heating and Air-Conditioning Engineers, and the 2nd Southwest Heating and Air-Conditioning Exposition, sponsored by ASHAE, in Dallas, Tex. The meeting will be at the Baker and Adolphus Hotels, and the Exposition in the Memorial Auditorium. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . **FEBRUARY 1-4, 1960.**

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, first to be held in the Western Hemisphere, at the Waldorf Astoria Hotel, New York City. Dr. Leo Wade, organizing committee, 15 W. 51st St., New York 19, N. Y. ..... **JULY 25-29, 1960.**

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*Advertiser appeared in preceding issue

CLASSIFIED ADVERTISING

Sold at $12 per column inch.

PRINTED FORMS available for immediate shipment. Heating & oil burner materials form, burner service record cards, service order forms, inspection information form, survey sheet and others. Also can supply **BURNER SERVICE** form in 8 part EZE-SNAP with 3 carbons in each set, 1200 sets Imprinted with your name, address and telephone, only $20.40. Send for samples—no obligation. Write Dept. AC, Degree Day Systems, 39-30 58th St., Woodside 77, N. Y.

MANUFACTURERS' AGENTS

An established manufacturer with 25 years experience producing ventilating equipment is looking for manufacturer's agents in many sections of the country to sell their new line of industrial fans. The products include axial flow and tubeaxial fans, both direct and belt driven, and power roof ventilators.
Please reply Box 914, Air Conditioning, Heating & Ventilating, 93 Worth St., New York 13, N. Y.

GRADUATE MECHANICAL ENGINEER: 5-10 years experience for design of industrial heating, air conditioning and fume control systems. Prefer industrial plant experience, but will accept up to 3 years consulting engineering as alternate. Send complete résumé of education, experience and salary requirement. Employment Department, Abbott Laboratories, North Chicago, Illinois.

WANTED

Sales engineer, expd selling heating & ventilating equipment to wholesalers & contractors. Liberal draw vs com. Box 847, 1501 Bway., N.Y.C.

HUGHES PRINTING CO.
EAST STROUDSBURG PA.

CONTROLS, SAFETY VALVES ..... are offered by this manufacturer with the thought that they are manufacturers of insurance. The company's engineers are continually developing new products designed to provide the maximum in efficient protection and control. Information available.
Inside Front Cover — Item 200

STEAM TRAPS CUT COSTS..... for contractors who use this company's steam traps because of smaller size, easy installation, and no call-backs. Traps work without attention 3 or 4 years. Steam trap book and unit heater trapping book available.
Page 1 — Item 201

CONDENSING UNIT ..... is offered in a complete package with all major components built and guaranteed by the manufacturer. An achievement in compact efficiency. It features interchangeable vital parts in capacities from 7½ through 150 tons. Can be equipped with multi-step capacity control. Information available.
Page 2 — Item 202

HEAT EXCHANGER INFORMATION... analyzes the many factors that affect the efficiency, maintenance and service life of heat exchange coils. For best performance in your own application, take advantage of the engineering research and design skill which company offers.
Page 5 — Item 203

STAINLESS STEEL FURNACES..... are a new product for heavy-duty applications. Up-flow, counterflow, horizontal, and duct models available. For industrial and commercial applications from 120,000 to 2,500,000 Btu. Larger specials made to specifications. Specification details offered.
Page 7 — Item 204

ALL-BRONZE BOOSTERS ..... have long service life in circulating hot or cold raw service water for faucet or industrial uses. Immune to corrosion, booster can be installed in numerous ways for increased efficiency, reduced costs. Bulletin available.
Page 9 — Item 205

FANS, MOTORS, VENTILATORS ..... produced by this manufacturer move more air more quietly for more years. In the past two years 1110 schools and universities throughout the country installed them. Quiet, vibration-free power. Low silhouette, low sound level. Self-cooled motors. Bulletins on propeller fans, air foil centrifugals, and power roof ventilators offered.
Pages 11-13 — Item 206

AIR CONDITIONING CONTROL ..... applied to modernization provides big dividends. Individual room control, provided by this company's equipment, has given the tenants of smog-ridden Los Angeles, Calif., office building year-round personalized comfort. Over 500 constant-air-volume regulators installed there. Information available.
Page 15 — Item 207

CENTRIFUGAL FAN EQUIPMENT .... is available for a wide range of engineered air systems—low-, medium-, or high-pressure. Corrosion resistant models offered. Full product data and information available from company which features dependable, low cost ventilation.
Page 17 — Item 208

29% MORE COPPER DRAINAGE TUBE has been sold in the last two years as reports from contractors show installed cost to be lower than for rustable materials, and that installation is quicker and easier. A badge of quality construction. Data folder offered.
Page 18 — Item 209

HEATING AND VENTILATING ..... units are flexible for any job, versatile for any need. Often one unit will do what normally requires two or more other units. Information is available.
Page 19 — Item 210

END WATER LEVEL WORRIES ..... in medium pressure boilers with company's combination that includes pump control and make-up feeder. Company offers simple installation and wiring diagrams covering every condition.
Page 21 — Item 211

HIGH VELOCITY PRECIPITATOR ..... is 16% shallower than the smallest competitive unit. Smallest face area in the field, too. Many quality features provided at lower cost. Complete information is contained in new bulletin.
Pages 22-23 — Item 212

MODERN CAST IRON BOILERS ..... fired with gas are offered. Compact design. Full capacity as rated by I-B-R, they can be equipped with the latest electronic controls and can be assembled at any stage of building construction, as sections pass through an ordinary door. Capacity increased by adding sections. Enclosed in handsome, insulated jacket. Literature available.
Page 24 — Item 213

CONTROL STEAM SYSTEMS BETTER with steam specialties produced with exclusive features that assure customer satisfaction and long, carefree service. A unit for every 1-pipe, 2-pipe, or industrial system. Complete catalog offered.
Page 25 — Item 214

PANEL FANS ..... replaced monitor windows in a wise plant modernization program which produced more effective ventilation. Information is available.
Page 26 — Item 215

TOP QUALITY COPPER TUBE ..... results in repeat orders by contractors. Every executive of this company, from the president down, is ready for any emergency request. Red tape is cut. Information available.
Page 27 — Item 216

ONLY THE BEST ..... air conditioning system would be selected for our new headquarters, and experience proves the best is definitely gas. So states the president of a Washington, D. C., advertising agency. Information is available.
Pages 28-29 — Item 217

NEW PACKAGED BOILERS ..... are Scotch type units of 15 to 651 hp, available high pressure or low pressure, for oil, gas or combination oil-gas. Built to be the best for capacity, safety, and dependability. Literature and catalog sheets offered.
Page 30 — Item 218

'59 BRONZE VALVE CATALOG..... illustrates and gives complete specifications of this manufacturer's low pressure, pressure rated, and special type bronze valves, including a new Y-pattern globe and check valve. All valves are guaranteed to operate perfectly. Company will rush your free copy.
Page 31 — Item 219

REGISTERS AND GRILLES ..... are added to this company's lines of diffusers, filters, exhausters, high velocity mixing boxes, and Punkah louvers. Entire Stewart line acquired. Information available.
Page 32 — Item 220

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

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Circle below item numbers on which you wish catalogs or further information

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PLEASE PRINT Feb. H-59

This service available only to U.S. and Canadian readers.

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after May 1, 1959

BOILER-BURNER UNITS .....
of this manufacturer are used for both heating and pharmaceutical processing in beautiful Stewart Co. building designed by Edward D. Stone. Due to forced draft firing, there is no stack to mar the symmetry of the building. Catalog and specifications offered.
Page 33 Item 221

STEEL PIPE .....
is used for heating and air conditioning at Houston office of the Prudential Insurance Company of America. Seamless or butt-welded pipe pays you back in outstanding service a hundred times over for every dollar you spend for it. Information available.
Page 34 Item 222

STAINLESS STEEL VALVES .....
available in patterns and alloys to satisfy most industrial needs. Produced by a company which, for almost a century, has produced valves made to peak standards of quality. New catalog offered.
Page 36 Item 223

THE FIRST MAJOR ADVANCE .....
in twenty years in the field of turbine refrigeration equipment is claimed for this manufacturer's centrifugal water chiller. Information is available.
Pages 36-37 Item 224

COPPER TUBE .....
has provided superior value for radiant heat installation in Brookfield Homes, one of the outstanding housing projects under way in Brockton, Mass. Information on types K, L, M, and DWV (copper drainage tube) is available.
Page 38 Item 225

CUSTOM ENGINEERED MOTORS .....
are produced by this company whose production facilities are unrivaled in the appliance and equipment motor field, assuring on-time deliveries. Company wishes to put more than 65 years of experience to work for you.
Page 40 Item 226

LEAK-PROOF UNIT HEATERS .....
are a "best buy" for spot-heating in plants and commercial buildings. Flexible, economical, and dependable, they are found in thousands of installations. Leakage inside the unit is positively eliminated. Bulletin available.
Page 41 Item 227

REFRIGERATION EQUIPMENT .....
includes a packaged chiller and two remote air-cooled condensers to create climatic conditions just right for penguins at San Diego Zoo. Another demonstration of company's ability to adapt its product. Information on air conditioning, refrigeration or heating available.
Page 42 Item 228

BALL BEARINGS SIMPLIFY DESIGN..
and assembly for Frick Co. In designing fan shaft bearings for their air cooling unit and evaporative condensers Frick needed positive protection against moisture. Information available.
Page 47 Item 229

DOOR HEATERS .....
are specifically designed to cover door openings with a curtain of warm air, thus increasing workers' efficiency and health, and reducing the load on the plant heating system. Prevents chilling drafts. Used wherever large doors must be opened during cold weather. Bulletin available.
Pages 48-49 Item 230

LOW VELOCITY AIR DIFFUSERS.....
were specified for the West's largest office building, the Kaiser Center at Oakland, Calif. Information on this high-quality line is available.
Page 50 Item 231

LOCK-SEAMING OPERATIONS .....
can give trouble; if they do, the company recommends switching to its zinc coated steel as other fabricators are doing. Booklet is available.
Page 51 Item 232

HIGH QUALITY BRONZE VALVES ....
are the only products of this company which offers a complete selection for industrial, commercial and domestic use. Over 550 different designs, each to meet a specific flow control requirement. New catalog describes complete line.
Page 53 Item 233

VANE-AXIAL FANS .....
are used to vent extremely corrosive fumes in a number of electroplating and chemical plants across the land. Efficient, quiet and compact. Hundreds of standard models available with V-belt or integral drive. Details offered in fan bulletin.
Page 54 Item 234

VERTICAL HEATING PUMP .....
is the answer to your heating pump problems. New high pump efficiency with minimum motor size. Features close-coupled design and mechanical shaft-seal. Sizes for all installations. New bulletin describes.
Page 55 Item 235

HEATING SPECIALTIES CATALOG ...
details many products by this well-known manufacturer of which many engineers are unaware. Includes: Packless radiator valves, thermostatic radiator traps, F&T traps, vents, boiler gages.
Page 56 Item 236

LARGE PIPE INSULATING .....
can be reduced in cost by using company's one-piece pipe insulation molded of fine glass fibers. It snaps on. Use it in thinner wall thicknesses and obtain same or superior insulating efficiency. Complete range to 36-inch IPS. Information offered.
Page 57 Item 237

UNDERGROUND SYSTEMS .....
for heat distribution are a specialty of this manufacturer. Hints on specifying are detailed in advertisement. A 24-page catalog with facts and figures for designing and specifying underground heat distribution systems is offered.
Page 58 Item 238

BONDED FAN RATINGS .....
by this company is your assurance of getting the air moving capacity you pay for. A $250,000 bond is on deposit with New York Trust Company, N. Y. Copy of catalog offered.
Page 59 Item 239

AIR DIFFUSION EQUIPMENT .....
is produced by this manufacturer in an impressive variety to meet every architectural and engineering requirement. Trademark guarantees quality. Information on complete line available.
Page 113 Item 240

INDUSTRIAL HEATERS .....
offered by this manufacturer are unsurpassed in efficiency, featuring competitive original cost; horizontal, vertical, or suspended installation; with gas, oil, or combination burners; for space heating, ventilating, make-up air, drying and oven applications. Specs and engineering data offered.
Page 115 Item 241

ASBESTOS-CEMENT PIPE BOOKLET..
offered by manufacturer contains 24 pages. Describes the layout and installation economies, wide variety of fittings, diameters, and lengths, its adaptability to venting service. Never needs painting, easily cut, resists most gases, fumes, and dusts.
Page 117 Item 242

NEW FAN PERFORMANCE CURVES..
on horizontal and vertical air handling unit, from 0- to 8-inches s.p. show at a glance from a single point: cfm, motor hp, relative efficiency, velocity, s.p., etc. Simplified method of establishing corrected fan rpm in a given installation.
Page 119 Item 243

ELECTRONIC AIR CLEANERS .....
are available in a new line including three cell designs to match exact job requirements: a high velocity unit with ¼-inch plate interval, another with 5/16-inch plate interval for advanced capacity for dirt loading, and a high capacity cell with ⅜-inch plate interval for still greater dirt loading capacity. Information available.
Insert bet. 120-125 Item 244

NEW PNEUMATIC VALVES .....
are available in a complete line to match every application. They have superior performance characteristics with sharply upgraded ratings. Designed for minimum maintenance. Information available.
Insert bet. 120-125 Item 245

STEEL SHEET WON'T FLAKE .....
which fact is proven, as illustrated in ad, by a powerful paving breaker hitting a sample sheet laid on the ground with 75,000 ft-lb of developed energy. Repeated blows hammered the sheet into the ground at the point of contact without a trace of its zinc coat flaking. Information available.
Page 124 Item 246

COMPLETE CONDITIONING LINE ....
includes central plant air conditioners, multi-zone air conditioners, sprayed coil units; heating and ventilating units, cooling and heating coils, and air-cooled condensers. Information offered on this line that can be relied on for efficiency, long life, and economical operation.
Page 125 Item 247

GAS-FIRED DUCT FURNACES .....
permit complete freedom to tailor the heating system to exact job requirements. Compact, efficient heat exchanger with full complement of combustion controls. Engineers specify all other components. Booklet explains.
Page 125 Item 248

FIRST CLASS
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AIR CONDITIONING, HEATING and VENTILATING
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NEW YORK 13, N. Y.

AD-DIGEST SERVICE

FOR FABRICATING LOUVERS ..... company offers a coil. Eliminates layout, tab cutting, hole punching, riveting, spot welding, etc. An economical and practical method for fabricating removable, hinged, or stationary louvers. Information available.
Page 125 Item 249

GLASS FIBER INSULATION ..... is available in a wide variety of facings, each one designed for a specific application. Ad illustrates use by Bryant Mfg. Co. in its assembly line operation. Complete information offered.
Page 127 Item 250

VERTICAL TANK SUCTION HEATER for underground fuel oil storage tanks, has easily accessible service connections, being designed to simplify both installation and servce. Heater suspended from tank manhole flange. All connections are outside the tank. Bulletin offered gives all details.
Page 129 Item 251

ROOF VENTILATION LINE ..... meets all requirements efficiently and economically. Low contour units, high velocity units, wind-driven turbines, and exhaust fans. Catalog available.
Page 131 Item 252

SPRAY NOZZLES ..... and all related accessories for humidifying are now available from a single, dependable source. For industrial installations of every size. Everything but the piping, wiring and compressor. Bulletin available.
Page 131 Item 253

UNDER-SILL CONVECTORS ..... custom fit without cutting, thereby saving installation time and expense. Standardized sections up to 4-ft lengths. Accessories for unusual building contours. Elements packaged individually for easy handling. Information available.
Page 131 Item 254

AIR-COOLED CONDENSER ..... won't rock, rattle or roar because engineers planned it that way. Condensers, available in 12 models, are dependable, too. Literature available.
Page 133 Item 255

POWER EXHAUSTERS ..... are offered by this company which developed the first spun aluminum, low contour exhauster years ago. Product improvement since then includes U-spring suspension, integral balance, and high point of discharge. Bulletin offered.
Page 135 Item 256

MOTOR STARTERS ..... for air conditioning service offer rugged simplicity. Simple, durable contactors assure continuous service. Information is available.
Page 137 Item 257

NEW MOTOR OPERATOR ..... is a transistorized electronic device for proportional control applications — individual room control, fan coil units, reheat coils, etc. No tubes or relays, but electronic control at no extra cost. Bulletin describes.
Page 138 Item 258

INDUSTRIAL DIFFUSERS ..... are available in a complete range of sizes to meet any industrial requirement. Adjusted easily from the floor to deliver any air pattern. Bulletin contains performance data, installation diagrams, and dimensions.
Page 139 Item 259

THESE HOT WATER GENERATORS .. are specifically designed for forced circulation systems. Distribute water evenly throughout the length of the pressure vessel. World-wide service organization. Folder offered.
Page 140 Item 260

PACKAGED AIR CONDITIONING .... is specified for the many engineering exclusives it offers: compressor that cuts operating and maintenance costs; over 300 air conditioner models to choose from; and safety features usually not offered, even as extras. All the facts and figures available.
Page 141 Item 261

FLEXIBLE EXHAUST HOSE ..... is recommended for dust control. Made of strong Neoprene coated cotton or nylon fabrics, spiral wire reinforced. Particularly good for elbows and moving hoods. Details available.
Page 142 Item 262

YEAR-ROUND CONDITIONERS ..... have filtered forced air gas furnaces in heating capacities from 60,000 to 250,000 Btu. Cooling capacities from 2 to 7½ tons. 24 counterflow or up-flow models. Air-cooled remote condensing units with matching evaporator coils. Information available.
Page 142 Item 263

QUIET, DEPENDABLE BLOWERS .... require a minimum of installation space. Mounting costs are reduced by these units which are wholly built by the company, including the motor. Three bulletins available.
Page 143 Item 264

AIR ENGINEERING BOOKLET ..... offered by air conditioning manufacturer whose systems give precise regulation of air temperature and moisture for processing, product drying, packing, storing, low temperature conversion, testing, and research. Components include evaporative heat exchangers, after coolers, condensers, air conditioners, and coolers.
Page 144 Item 265

UNDERGROUND PIPING ..... services the famous Salk Hall at the University of Pittsburgh; over 10,000 ft of it for an area over one quarter square mile. This manufacturer's product presently in use in over 500 universities, colleges, and schools for steam supply. Complete literature offered.
Page 145 Item 266

ZONE-CONTROL VALVE ..... ensures comfort in each area of the home or building but eliminates burning of fuel to furnish unwanted heat. Contains built-in auxiliary switch which automatically starts circulator or burner when any valve is in open position. Brochure available.
Page 146 Item 267

COOLING TOWER SAVES WATER ... to the tune of $75,000 a year for Conrad Hilton Hotel in Chicago. Installed in 1956, chief engineer attests that it is paying its own way. Bulletin describes tower line.
Page 147 Item 268

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93 WORTH STREET
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SUBSCRIPTION DEPARTMENT

NEW FILTER GAGE .....
tells exactly when to change filters, lasts indefinitely, and fits all furnace and air conditioning units. Costs only $1.95. Free sample offered.
Page 148 Item 269

CENTRIFUGAL ROOF EXHAUSTERS..
of lowest silhouette design enhance the beauty of building skylines. Forward or backward curved wheel within or without scroll housing. Certified cfm ratings. Bulletin is available.
Page 148 Item 270

CUSTOM-BUILT AIR CONDITIONING
is available for commercial, industrial, and residential applications. You specify air discharge and return arrangements and the most practical location for utility service and maintenance access openings. Various combinations of equipment in the same cabinet provide infinite variations in performance. Mass production prices. Full product literature offered.
Page 149 Item 271

SHOWER MIXING VALVE .....
provides positive protection. Automatically eliminates the constant danger of scalds or chills. Costs no more than ordinary shower valves. Bulletin available.
Page 150 Item 272

POSITIVE SEALING INDICATORS ....
proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 151 Item 273

DRAFT, AIR FILTER GAGES .....
indicate and control pressure of gas or air. Magnetic type mercury switch operates alarm and door signal light. Transformer, alarm bell, siren, horn signal light, 110 or 220 volts, optional. Bulletin available.
Page 151 Item 274

UNIT SILENCER LINE .....
for air conditioning and ventilating systems offered. Effectively reduce airborne noise generated by fan. Easily, conveniently installed at low cost. Prices compare favorably with conventional duct lining. Complete literature offered.
Page 151 Item 275

AIR FILTER BULLETIN .....
tells this company's story about its automatic renewable filter, handling millions of cfm now being installed throughout the country. Has quality features unexcelled by others.
Page 152 Item 276

STAINLESS STEEL FLOATS .....
are offered for high pressure, high temperature, and for corrosion resistance. Catalog available.
Page 153 Item 277

CENTRIFUGAL ROOF EXHAUSTERS..
are offered by this company. Four different models are illustrated in advertisement. A catalog is offered which describes each of them briefly.
Page 153 Item 278

100% SEALANT .....
prevents many man-hours lost in taking down, re-doping, and re-assembling connections. Plastic lead compound gives complete seal in original connections. Free sample available.
Page 153 Item 279

DIRECT READING VELOMETER .....
measures actual air delivery. Simple, direct reading gives instant measurement in any distribution system. Device is portable, easy to understand and to use. Bulletin is available.
Page 154 Item 280

REFRIGERATION EQUIPMENT .....
from this manufacturer is world renowned for a long trouble-free life of dependable operation in any refrigeration service. Information is available.
Page 155 Item 281

INDUSTRIAL FAN LINE .....
consists of blowers and exhausters for diversified industrial application. Standard models promptly available. Information on this line is offered by company which builds air handling and conditioning equipment exclusively.
Inside Back Cover Item 282

PNEUMATIC THERMOSTATS .....
are especially developed for air conditioning, heating, ventilating, and industrial applications requiring extreme accuracy of control at low sensitivities—for control of temperatures in air ducts or chambers, tanks and pipes. Choice of elements. Full details are offered in bulletin.
Back Cover Item 283

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information

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Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone** ....**State** .....

This card is void after May 1, 1959

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93 Worth Street, New York 13, N. Y.

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to stretch your equipment dollar
to the utmost — call on
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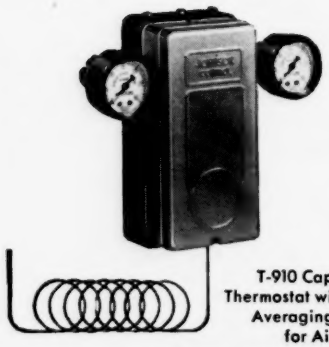
JOHNSON SERIES T-900 THERMOSTATS
FOR CONTROL OF AIR, STEAM AND LIQUIDS

T-900 Remote Bulb Capillary Thermostat for Air, Steam or Liquids.

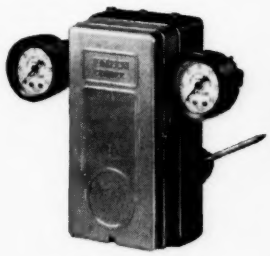
- Especially developed for air conditioning, heating, ventilating and industrial applications requiring extreme accuracy of control at low sensitivities. For control of temperatures in air ducts or chambers, tank and pipes.
- Choice of elements:
  1. Liquid filled capillary with remote bulb. Standard temperature range from −30F to 300F; to 600F on special order. Fully compensated stainless steel capillaries available from 8 to 85 feet. Non-compensated copper capillaries furnished in 4 and 6-ft. lengths.
  2. Rigid stem liquid filled insertion element. Temperature range −30F to 300F.
  3. Rigid stem liquid filled immersion element. Temperature range −30F to 300F.
- All elements are fully interchangeable.
- Pneumatic follow-up movement (feedback) assures stable, highly accurate response at lowest required sensitivities. Sensitivity is adjustable.
- Unaffected by ambient temperature or static head. Remote bulb may be located at any point above or below thermostat.
- Proportional action.
- Direct or reverse acting. Simple change of pivots converts from direct to reverse acting.
- Widely used both as a standard thermostat and as a master controller for readjusting the control setting of a submaster thermostat.

For full details, write for Bulletin T-900. Johnson Service Company, Milwaukee 1, Wisconsin.



T-910 Capillary Thermostat with 8-foot Averaging Bulb for Air.

T-902 Rigid Stem Insertion Thermostat for Air.



T-904 Rigid Stem Immersion Thermostat for Liquids.

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